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Planning for visitor access: A case study of West Coast glacier country

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Abstract of:

Planning for visitor access: A case study of West Coast Glacier Country

By

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Since the 1800s, the Franz Josef and Fox Glaciers in Westland *Tai Poutini* National Park have drawn visitors to the West Coast region of New Zealand's South Island. However, rapid glacial retreat over the past decade has created challenges in providing safe visitor access to these glaciers. This has had significant impacts for the local tourism industry, and challeneged the adaptive capacity of the Planning sector to respond to ongoing glacial changes within this dynamic environment. The planinng sector's response to diminished visitor access has yet to be examined. Using a qualitative approach, this research investigated planning decisions made in relation to visitor access to the glaciers, as well as possibilities for future management of this unique natural environment through semi-structured interviews with planning stakeholders. Results revealed various statutory, non-statutory, and community-based responses to glacier retreat and diminished visitor access, and demonstrated that visitor access to the glaciers is affected by more than just glacier retreat.

Keywords: Franz Josef glacier, Fox glacier, Westland Tai Poutini National Park, glacier retreat, climate change, adaptive strategies, planning, tourism.

Acknowledgements

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My thanks also go to the various participants who gave their time and valuable knowledge for this research. It would not have been possible without you, and I hope that your work benefits from the findings of my research.

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Chapter 1

Introduction

1.1 Glacier tourism

Tourists have long been lured to the world's mountanous regions, seeking natural beauty and adventure (Furunes & Mykletun, 2012), with glaciers, particularly those which are easily accessible, often the key attraction of these areas (Hay & Elliot, 2008). Local communities have thrived from glacier tourism and many are now heavily reliant on the economic benefits such tourism provides (Anderson, Lawson & Owens, 2008; Hay & Elliot, 2008). However, glaciers are especially sensitive to climatic variations, and are already experiencing the effects of climate change (Furunes & Mykleton, 2012; Wang & Zhou, 2019). Many, if not most, glaciers around the world are currently retreating as a result of climate change (IPCC, 2013). Retreat makes accessing glaciers for tourism and recreation purposes harder, and glaciers often lose their aesthetic appeal, which can affect visitor satisfaction and demand (Garavaglia, Diolaiuti, Smiraglia, Pasquale & Pelfini, 2012). There is growing concern that local tourism industries dependent on such tourism will be, if they are not being already, adversly affected by glacial retreat (Espiner & Becken, 2014; Ooi, Duke & O'Leary, 2018; Stewart, Wilson, Espiner, Purdie, Lemieux & Dawson, 2016). The impacts of glacial retreat are especially evident at the Franz Josef and Fox glaciers in New Zealand, where glacier retreat over the past decade is making access to the glaciers increasingly difficult. Of interest to this research are the planning aspects related to maintaining visitor access in dynamic mountain environments.

1.2 Maintaining access

One of the key challenges for the glacier-based tourism industry is maintaining access to the glaciers on which it depends in the wake of on-going glacier retreat. As glaciers retreat the surrounding terrain can become unstable, increasing the risk of rockfall and other hazards (Purdie, 2013). Ensuring visitor saftey and safe access to glaciers is therefore a top prioirty for tourism operators, as well as for agencies which have legislative directives to foster recreation in these areas (Hay & Elliot, 2008; Purdie, 2013; Wang & Zhou, 2019). Not only does glacier retreat raise concerns around hazards and visitor saftey, but it also increases the tension between preservation of glacial landscapes versus the recreational use of them. The ongoing tension between conservation and tourism, and also between commerical tourism and public recreation, is likely to come to the forefront as access to glaciers becomes more difficult (Boyd, 2000; Higham & Maher, 2007; Ooi et al., 2019; Purdie, 2013). Adaptive planning mechnisims which can manage access to glaciers, ensure visitor saftey, balance

the competing interests of conservation and tourism, and adapt to ongoing changes will become increasingly important in the future.

1.3 Franz Josef and Fox glaciers within Westland *Tai Poutini* National Park

To examine how agencies responsible for the management and human use of glacial landscapes are responding to glacier retreat and diminishing visitor access, this research explores planning responses to current visitor access issues related to the Franz Josef and Fox glaciers within Westland *Tai Poutini* National Park (WTPNP), on the South Island of New Zealand. Since 2008, both glaciers have experienced significant retreat, resulting in the loss of foot access onto both glaciers (Purdie, 2013). As a location highly dependent on glacier tourism, this case study is appropriate for examining the impacts of diminished glacial access on a regional tourism industry, and the response from those responsible for managing the glacial environment. By gathering the views of various stakeholders involved in the management of these glaciers, this research aims to identify how issues around glacier access are being addressed and explore the adaptive capacity of current planning mechanisms to accomodate future changes to the glaciers. A more in depth examiniation of the case study is presented in Chapter 2.

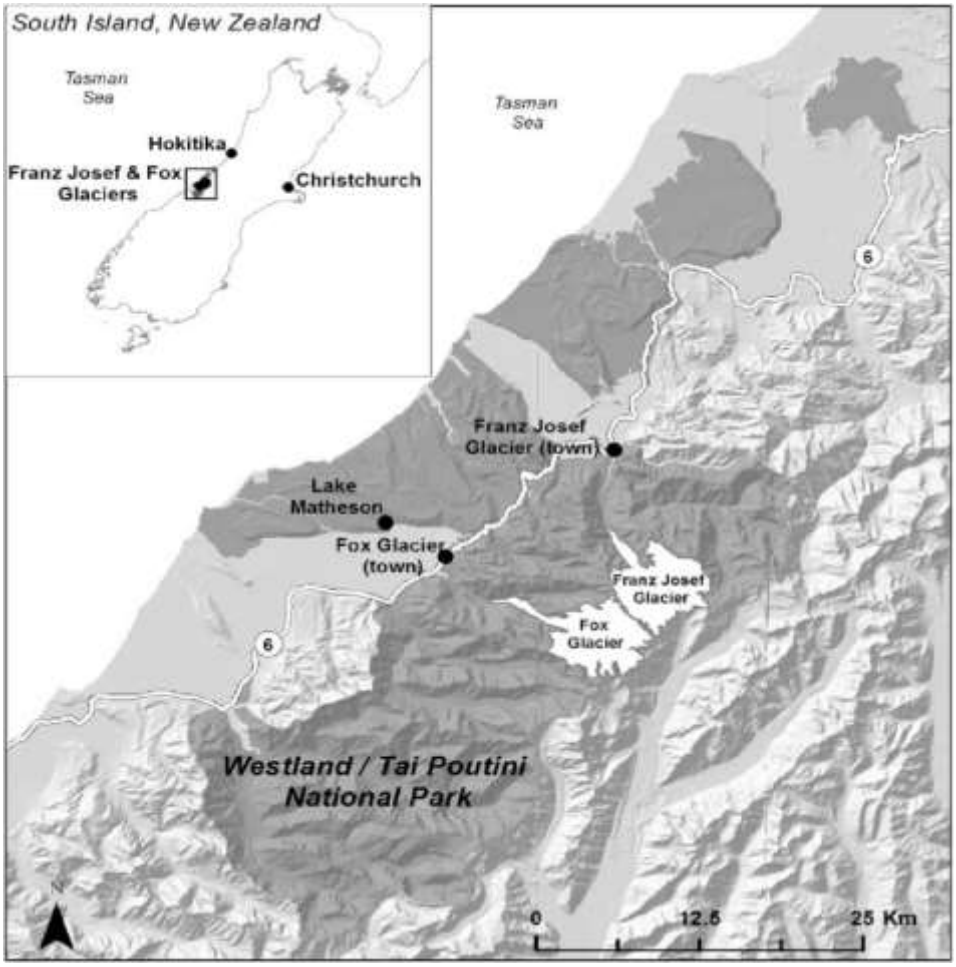

Figure 1. Location of Westland Tai Poutini National Park (Source: Stewart et al., 2016).

1.4 Research aim and objectives

The overall aim of this research was to explore the risks and opportunities of maintaining visitor access to the Franz Josef and Fox glaciers of Westland *Tai Poutini* National Park, within the planning context of the Conservation and National Parks Acts. Three aspects of this topic were used as guiding objectives for the research. These three objectives were:

1. To better understand how selected stakeholders are negotiating the tension between tourism development and conservation management at Franz Josef and Fox glaciers within Westland *Tai Poutini* National Park.

2. To document how interviewed stakeholders currently plan for, maintain, and address challenges relating to safe visitor access to the glaciers of Westland *Tai Poutini* National Park, whilst meeting tourism, community, and conservation needs.

3. To identify future options and planning mechanisms to help stakeholders by informing future consultation with Treaty partners, and stakeholders omitted in this study to address any potential consequences of diminished visitor access to the glaciers of Westland *Tai Poutini* National Park.

1.5 Overview of dissertation structure

This dissertation begins with an overview of relevant literature, including academic literature, as well as related plans, policies, and legislation. The literature review is presented in three parts, the first identifying specific issues facing glacier tourism, the second exploring the chosen case study for this research, and the third identifying relevant planning mechanisms currently in place to manage glacier access. Following this, the methodology chapter presents the methods for data collection and analysis used in this research. Results and analysis are then presented over two chapters, the first chapter dealing with 'issues', and the second chapter dealing with 'responses' to these issues. A concluding discussion follows in which research results and relevant literature are brought together to address the original research objectives stated above.

During the course of conducting this research New Zealand was affected by the global COVID-19 pandemic. The effects of this pandemic on New Zealand's tourism industry are expected to be severe, especially in regions like the West Coast, where towns such as Fox Glacier and Franz Josef are heavily reliant on international tourism. However, as the findings of this research were compiled prior to the outbreak they will be presented in this dissertation without reference to COVID-19. In the final chapter some of the possible implications of COVID-19 for glacier tourism, planning, decision-making, and the findings of this research will be briefly discussed.

Chapter 2

Literature Review

To provide background context for the research, this literature review will discuss the phenomenon of glacier tourism, and how this nature-based form of tourism is being impacted by climate change. A further exploration of glacier tourism in New Zealand, with a particular focus on the case study of the glaciers within Westland *Tai Poutini* National Park will follow. The final section of this literature review will examine the planning framework that guides activities within and management of the glacier region on the West Coast.

2.1 Glacier tourism

A dynamic and ever-changing environment, glacial landscapes are equal parts fascinating and hazardous. Their natural power and beauty coupled with potential danger is what draws tourists to glacial areas. For this reason, glacier tourism is often classified as adventure tourism (Furunes & Mykletun, 2012). Activities such as glacier walks, sightseeing, overflights, and snow landings are some of the many activities undertaken by tourists in glacial areas (Wang & Zhou, 2019). Glacier tourism tends to flourish where glaciers are most easily accessible, Franz Josef and Fox glaciers in New Zealand being classic examples, and many local communities have become economically dependent on the income from glacier tourism (Hay & Elliot, 2008).

Glaciers are not only important to local tourism industries as natural attractions, but also as valuable freshwater resources for communities, for hydro-electric power generation and irrigation, and are also culturally significant to various indigenous peoples around the world (Anderson et al., 2008). For the purpose of this research, the role of glaciers in tourism will be the primary focus rather than their role in freshwater or electricity provision. Of interest is the potential vulnerability of glacier tourism to climate change given its reliance on a scarce and climatically sensitive resource (Furunes & Mykletun, 2012; Wang & Zhou, 2019).

Climate change is already affecting many tourism destinations which are reliant on stable climatic conditions, such as mountain destinations which rely upon natural snowfall and cool temperatures (Ooi et al., 2018). Mountain destinations around the world are already feeling the effects of climate change, with many experiencing warmer conditions, changing precipitation patterns, and an increase in extreme weather events (Hay & Elliot, 2008; IPCC, 2013). In 2013 the Intergovernmental Panel on Climate Change (IPCC) reported that almost all glaciers around the world are retreating and have been doing so since the 1950s (IPCC, 2013). It is for this reason that glaciers are often used as a visual representation of the impacts of climate change (Welling, 2015). These climatic changes can have

drastic impacts on the quality and perceived attractiveness of mountain areas, particularly where glaciers are concerned. Tourism demand and destination desirability are both affected by aesthetic changes to glacial areas, which can have severe impacts on local tourism industries that rely on glacier tourism (Ooi et al., 2018; Scott, Jones & Konopek, 2007). Glacial retreat not only reduces the aesthetic quality of glaciers but also increases the risk of hazards, such as rockfalls, raising concerns about visitor safety and the ability to experience a glacier at close proximity (Purdie, Gomez & Espiner, 2015). Entering and accessing glaciers is expected to become increasingly difficult as time goes on. Both reduced aesthetic quality and increases in hazards are expected to have dramatic impacts on glacier tourism industries in terms of visitor demand and safe visitor access (Hay & Elliot, 2008; Purdie, 2013; Wang & Zhou, 2019). IPCC explicitly acknowledge that glacial retreat will adversely affect tourism dependent towns, such as Franz Josef and Fox townships in New Zealand (IPCC, 2013; Purdie, 2013; Anderson et al., 2008).

Each glacier faces a different future, with some experiencing a decline in aesthetic quality or attractiveness, while others face sustained decline and potential extinction (Wang & Zhou, 2019). Glacier National Park in the Rocky Mountains, USA, is a classic example of glacial retreat, with only 25 of the original 150 glacier remaining active today (Goff & Butler, 2016). In August 2019 the Ok glacier was the first glacier in Iceland to be formally declared extinct (Magnason, 2019). Those that survive may experience reduced aesthetic quality and accessibility, which may affect glacier tourism demand, thus adversely affecting the livelihoods of those dependent upon glacier tourism (Purdie, 2013; Wang & Zhou, 2019).

Although some glacier tourism operators fail to see the necessity of adapting their businesses in response to glacier retreat and diminishing access to the glaciers upon which their businesses depend (Welling & Abegg, 2019), many glacier tourism operators around the world are adapting to glacier retreat. Some of these adaptive strategies include changing the way visitors access the glaciers (e.g., through aircraft access), or diversifying away from glacier tourism and providing other experiences such as mountain biking, climbing, and other mountaineering activities (Salim, Mourey, Rayanel, Picco, & Gauchon, 2019). Even in cases where glaciers are expected to become extinct, such as the Yulong Mountain glacier in Lijang, tourism operators are looking at how the area could continue to attract visitors without a glacier. In the case of the Yulong glacier, there are discussions around turning the area into a reservoir, and providing golf and rivulet tourism (Yuan, Ning, & He, 2006). However, there is far less understanding of how those responsible for management of glacial areas are responding to glacier retreat (Stewart et al., 2016). Welling and Abegg (2019) suggest that official responses to glacier retreat have largely adopted a ‘wait and see’ approach, along with reactive adaptation measures, rather than proactive long-term adaptation strategies.

While it is thought that reduced aesthetic quality of glaciers caused by glacial retreat may lead to a reduction in visitation, there is some evidence that suggest the opposite occurs. Visitor numbers in some high tourism areas are, in fact, increasing as tourists *rush* to visit vanishing landscapes before it is too late. This phenomenon has been dubbed 'last chance tourism', and is observable in places such as the Maldives, the Great Barrier Reef, Antarctica, and the Arctic (Buckley, 2017; Lemelin, Dawson & Stewart, 2012; Ooi et al., 2018; Purdie, 2013; Stewart et al., 2016; Vila, Costa, Angulo-Preckler, Sarda & Avila, 2016). While last chance tourism may help to sustain tourism industries threatened by climate change impacts in the short-term, it can have detrimental effects for the already vulnerable environments. Increased visitation to a landscape that is already vulnerable to climate change, such as a glacier, creates a paradox in that higher visitor numbers increases greenhouse gas emissions through travel, thus exacerbating existing pressures on these climatically sensitive environments, and accelerating their decline (Buckley, 2017; Dawson, Johnston, Stewart, Lemieux, Lemelin, Maher & Grimmwood, 2011; Espiner & Becken, 2014; Ooi et al., 2018). Increased visitation may be manageable and economically beneficial to local tourism industries in the short-term, but such tourism is unlikely to remain sustainable in these vulnerable destinations over the long-term (Dawson et al., 2011; Ooi et al., 2018). As glaciers continue to retreat, last chance tourism may also put more pressure on remaining glaciers that are still accessible (Purdie, 2013).

The tension created by last chance tourism between increased visitation and subsequent environmental degradation, echoes the long-standing tension between tourism and conservation in glacial areas. Many of the world's most accessible glaciers are situated within national parks, which aim to protect and conserve the natural environment. To do so, however, requires extensive funding, some of which can be provided by tourism. In a sense, the two are symbiotic; conservation requires the financial input from tourism, and tourism provides a way to raise awareness about environmental change, but without the natural environment there would be no tourism opportunities (Boyd, 2000; Buckley, 2017; Budowski, 1976; Dearden, 2000; Higham & Maher, 2007; Ooi et al., 2018). As such, both tourism and conservation rely on maintaining access to the natural environment, such as glaciers, albeit for different reasons. While conservation seeks to maintain funding in order to protect the natural environment, tourism seeks preferential access in order to maintain a profit (Buckley, 2017). A delicate balance must, therefore, be struck between public use and preservation (Booth & Simmons, 2000; Boyd, 2000). As last chance tourism increases the demand for glacier tourism, decision-makers must carefully manage access and use of glaciers versus protecting and conserving them (Buckley, 2017; Purdie, 2013).

2.2 Case study: West Coast glacier region, New Zealand

This section details the case study for the research, that being the West Coast Glacier Region in New Zealand, and two of the region's glaciers; the Franz Josef and Fox glaciers. Situated in the West Coast region of New Zealand's South Island, within the Westland *Tai Poutini* National Park, and the Te Wāhipounamu – South West New Zealand World Heritage Area, Franz Josef and Fox glaciers are of significant environmental, cultural, and economic importance to the West Coast region and wider New Zealand. As is acknowledged in the Westland *Tai Poutini* National Park Management Plan, the glaciers and surrounding area are of cultural importance to Ngāi Tahu, who hold rangatiratanga (chieftainship) and manawhenua (customary rights) over the lands administered by the Department of Conservation on the West Coast (Department of Conservation, 2014, p. 17).

Figure 2. Franz Josef Glacier / Kā Roimata o Hine Hukatere (Emily Somerfield, 2019).

Of New Zealand's 3100 glaciers, the Fox and Franz Josef glaciers are two of the most intensively utilised for tourism, alongside the Tasman glacier (Purdie, 2013). These three glaciers are popular amongst domestic and international visitors alike for their easy public accessibility and natural beauty, allowing visitors an up-close experience with the glaciers. Glacier tourism has a long history

in New Zealand, dating back to the establishment of the Hermitage Hotel in Aoraki/Mt Cook and guided walks on the Tasman glacier in the 1880s (Purdie, 2013). However, because of New Zealand's maritime climate these glaciers are particularly sensitive to climate variations and have rapid advance and retreat cycles. Should climate change cause these three glaciers to retreat beyond feasible access, New Zealand's tourism industry could potentially loose its competitive edge and experience a decline in visitation and revenue (Hay & Elliot, 2008; Purdie, 2013).

The West Coast region has traditionally relied upon natural resources to fuel its regional economy, with coal mining one of the historic industries on the coast. However, with about 90% of its area deemed conservation land, development options available to the region are limited. One industry offering some economic diversification for the region is tourism, which has been a key driver of the West Coast economy since the early 2000s. Between 1999 and 2005 the West Coast saw an increase in visitation of 98% compared to 47% nationally, due to better access and promotion of the conservation estate, particularly the Fox and Franz Josef glaciers within Westland *Tai Poutini* National Park (WNP) (Conradson & Pawson, 2009). Fox and Franz Josef glaciers have since become a core part in the continued success of the West Coast region, with the Department of Conservation labelling them icon destinations (Department of Conservation, n.d). As both glaciers have relatively accessible ice tongues at low elevations guided glacier walks have been a historically popular activity (Purdie, 2013). The glaciers receive most visitors between December and March, with Franz Josef recording its busiest day on January 1st 2020, with 7,137 visitors in a single day. From June 2018 to July 2019, 320,605 people visited the glacier region on the West Coast (Development West Coast, 2020).

However, rapid glacial retreat since 2008 has meant that foot access onto both glaciers is now closed, and road access to the Fox glacier walking track has also been lost, posing significant challenges for those seeking to access the glaciers for tourism and recreational purposes (Field, 2015). Both the Fox and Franz Josef Glaciers have undergone various retreat and advance phases over time, during which the terminus of these glaciers can vary by 1 km (Purdie, 2013). These glaciers, compared to others around the world, have quick response times to climatic variations, Franz Josef's response time is 3 to 4 years, and Fox glacier's is 5 to 6 years, meaning that they undergo rapid advance and retreat phases (Purdie, Anderson, Chinn, Owens, Mackintosh & Lawson, 2015). The most recent advance of the Franz Josef and Fox glaciers ended in 2008 (Purdie, 2013). Between 2008 and 2015, the Fox glacier retreated over 700 metres and lost 150 m of ice thickness, with similar reductions occurring at Franz Josef Glacier over the same period (Purdie et al., 2014; Purdie et al., 2015). Both glaciers are close to their previous minimums, and have also experienced considerable thinning, indicating that retreat will continue well into the future (Purdie, 2013). Retreating glaciers tend to become increasing 'dirty' as ice melt exposes rock, and can cause glacial valley walls to become unstable, increasing the risk of rockfall (Purdie, Hutton, Stewart & Espiner,

2020). This is evident particularly at the Fox glacier, which has become increasingly debris-covered. The previously convex glacier cross-profile has flattened, and rocks are now able to travel up to 50 metres onto the glacier surface (Purdie et al., 2015).

Projections of future glacier retreat differ and are largely dependent on the extent of climate warming. Climate modelling from one study suggests that by 2100, Franz Josef Glacier will recede from 11 km to 6.4 km in length, and lose 62 percent of its volume (Anderson et al., 2008). While both glaciers are expected to significantly retreat, they are better situated to withstand projected climate warming compared to other glaciers in New Zealand because of their location in maritime environments and are unlikely to become extinct. It is, however, likely that tourism reliant on these glaciers will be considerably affected by continued glacier retreat (Anderson et al., 2008). Some tourism operators remain sceptical that glacier retreat is attributed to climate change, this view is also evident at other glacier tourism locations around the world (Stewart, et al., 2016).

Figure 3. Photos showing the retreat of Franz Josef glacier, Westland *Tai Poutini* National Park, between 2008 and 2019. (Photo credit: Emily Somerfield, 2008; Emily Somerfield, 2019)

2.2.1 Adaptive responses

In response to these bio-physical changes to the glaciers, both tour operators and area managers have adapted their operations. Increasingly difficult foot access to the glaciers, and a heightened risk of rockfall has seen a rise in commercial helicopter activities, such as scenic flights and Heli-hikes, on higher, flatter parts of both glaciers (Purdie, 2013). The increase in aircraft activity within the glacier valleys has seen tensions emerge with some visitors annoyed with aircraft noise. The irony in tour companies using helicopters, which produce carbon emissions, to show visitors the glaciers and educate them on climate change has also been noted by researchers (Espiner & Becken, 2014; Purdie, 2013). Aircraft access has been the main form of access to both the Franz Josef and Fox glaciers since the collapse of the front 70 metres of Franz Josef glacier in 2012 (Stewart et al., 2016). Tourists who visit the glaciers independently rely on public access tracks and viewing platforms

(Purdie, 2013), and while independent visitors can still walk to viewing areas in the Franz Josef valley, since March 2019 the Fox valley access road has been closed indefinitely due to a landslide (Oppert, 2019). This poses significant challenges for the Department of Conservation who seek to provide free public access to the national park and its attractions. In regard to management adaptations, most strategies and initiatives have focussed on increasing hazard signage within the glacier valleys, increasing the number of aircraft landings within the glacier valleys, and developing new trail routes to facilitate access to areas where the glaciers can be viewed (Stewart et al., 2016). There is currently little understanding of management responses and adaptation to changes in bio-physical resources, such as glaciers within protected areas (Stewart et al., 2016). The current research aims to progress understanding of management responses and decision-making within the context of glacial retreat at Franz Josef and Fox glaciers.

Given that local tourism businesses have already been impacted by glacier retreat at both Franz Josef and Fox glaciers, and that further effects of climate change are expected to exacerbate glacial retreat, visitor access and safety will continue to be issues for the foreseeable future. Many businesses are already adapting to these changes by diversifying their tourism activities, such as the West Coast Wildlife Centre and hot pools in Franz Josef township. However, many activities remain directly related to the glaciers (Hay & Elliot, 2008; Wilson, Becken & Espiner, 2012). Under a mean climate change scenario, Franz Josef is projected to retreat 5 km and lose 38% of its mass by 2100 (Anderson et al., 2008). Under different climate change scenarios, the range of glacier retreat varies from 3.9 to 6.4 km, with a loss of volume between 26 and 58 per cent (Anderson et al., 2008). This will dramatically change the nature of these glaciers, affect public access, helicopters may lose their landing sites, and the glaciers will lose much of their aesthetic appeal (Wilson et al., 2012). The local tourism industry will need to look towards further diversification of tourism activities in order to survive these immense glacial changes (Hay & Elliot, 2008), and those responsible for management of the glacier region will need to ensure adaptive planning mechanisms are in place to address public access and safety around the glaciers.

The information presented here regarding glacier tourism on the West Coast does not take into account the recent events of COVID-19. As a region reliant on international tourism, the West Coast tourism industry has been hit hard by the COVID-19 pandemic. Visitor numbers to the region have plummeted following the global crisis, and it is likely that visitor numbers will remain low for some time (Statistics New Zealand, 2020). This will no doubt have a significant impact on tourism businesses in the area, and on local communities. However, as this research was conducted prior to the outbreak, results of this research will be presented without reference to COVID-19, but the implications of COVID-19 in relation to glacier tourism and access planning on the West Coast will be

discussed in the final chapter. What follows is an explanation of the planning framework which guides management of the glacier region on the West Coast.

2.3 Planning framework

While there is significant research examining the effects of climate change on glacier tourism, there has so far been little exploration of how decision-makers are responding to this issue. What decisions are being made around future access to Franz Josef and Fox glaciers, and how are these decisions being made? How is the increasing safety risk to visitors being addressed? And what plans and policies are in place to guide decision-making around these issues? To explore these questions, this section examines the New Zealand planning framework and how it applies to the glaciers within Westland *Tai Poutini* National Park.

As Franz Josef and Fox glaciers are within Westland *Tai Poutini* National Park, it is first necessary to establish how national parks are managed in New Zealand. There are two key pieces of national legislation which govern management of national parks in New Zealand, these being the National Parks Act 1980 and the Conservation Act 1987. The latter is responsible for establishing the Department of Conservation (DOC) (Conservation Act 1987, s 5), whose responsibility it is to oversee the National Parks Act 1980, and both the preservation and use of national parks, an often-conflicting position (Booth & Simmons, 2000; Sowman & Pearce, 2000). The purpose of the National Parks Act 1980 and the plans which operate under it, is to preserve New Zealand's national parks in perpetuity for their intrinsic worth and for the use and enjoyment of the public (National Parks Act 1980, s 4). As the glaciers are within national park boundaries, they fall under the management of DOC. As required by the National Parks Act 1980, DOC must guarantee public access to national parks whilst also maintaining their natural state (National Parks Act 1980, s 43; Sowman & Pearce, 2000). The connections between these two pieces of legislation and the plans and policies they give effect to are presented Figure 4 and will be discussed further throughout this section.

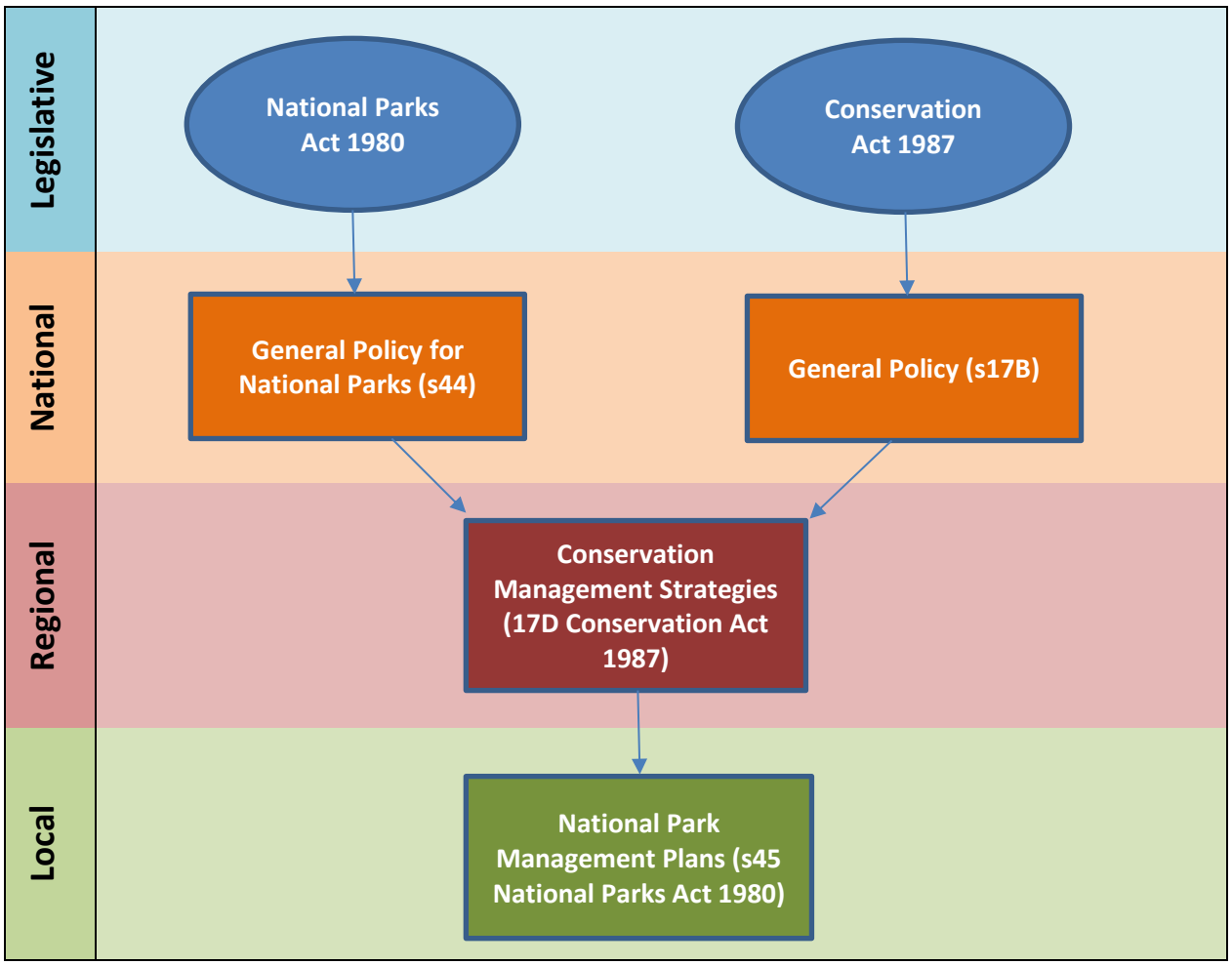

Figure 4. Hierarchy of planning documents related to National Park Management Plans, and the broad spatial scale of each level.

Both the National Parks Act 1980 and the Conservation Act 1987 require the development of General Policy in relation to national parks, and other public conservation lands and waters. General Policy for national parks is developed by the New Zealand Conservation Authority (National Parks Act 1980, s 44), with the most recent General Policy developed in 2005 (New Zealand Conservation Authority, 2005). General Policies operate at a broad, national level, and give direction to the, more regionally based, Conservation Management Strategies (CMS), developed by Conservation Boards. In relation to national parks, a CMS provides objectives for management of national parks within the applicable jurisdiction. Each national park must have a National Park Management Plan (NPMP) to direct activities within the national park (National Parks Act 1980, s 45(1)). The development of both NPMPs and CMSs involves a process of public consultation, in which any interested parties may make submissions on the proposed plan and speak to their submission if they so desire (Conservation Act 1987, s 17F; National Parks Act 1980, s 47(2)). Both NPMPs and CMSs must be reviewed every ten years (Conservation Act 1987, s17H(4)(b); National Parks Act 1980, s 46(3)). An NPMP must be consistent with a CMS (National Parks Act 1980, s 44A), thus in turn giving effect to General Policy. NPMPs not only govern management of national park areas, but must also be regarded when

preparing other plans and processing resource consent applications under the Resource Management Act 1991 (Resource Management Act 1991, s 74(2)(b)).

As the management authority for national parks in New Zealand, DOC must operate in accordance with all General Policy, Conservation Management Strategies, and National Park Management Plans (National Parks Act 1980, s 43). In terms of tourism activities within national parks, DOC is responsible for providing infrastructure (tracks, roads, campsites), visitor information and services, and a concessions system for private sector tourism activities within public conservation areas. Activities within national parks, including commercial tour operations, require a concession from DOC (Higham & Maher, 2007). These concessions, if not provided for in the relevant NPMP, must be approved by the Minister of Conservation (Conservation Act 1987, s 170; National Parks Act 1980, s 49). Through their concession system, DOC has been able to meet some of its legislative requirements related to offering recreation opportunities (via tourism) to the public, and generate revenue for the department to promote conservation through the conditions imposed on concessions (Sowman & Pearce, 2000).

The Franz Josef and Fox glaciers are managed under the Westland *Tai Poutini* National Park Management Plan (WNPMP). The original plan was created in 2001, has been amended twice in 2008 and 2014, and is currently under review at the time of conducting this research. The new draft WNPMP was put on hold in 2019 at the request of Ngāi Tahu, so that the implications of a recent Supreme Court decision relating to Ngāi Tahu and how this may affect notification of draft plans could be investigated. The draft plan is expected to move forwards in 2020 (Department of Conservation, 2019). The amendment to the WNPMP in 2008 was to allow shared cycling and walkway access to the Franz Josef and Fox glacier valleys, and the 2014 amendment made changes to policies on aircraft access, road access, vehicle use, and glacier guiding in the wake of rapid glacial retreat (Department of Conservation, 2014). The WNPMP recognises Franz Josef and Fox glaciers as icon destinations, or sites of intense interest and visitor use. Maintaining access to the glaciers in order to support the glacier tourism industry and visitor access to the area is a key priority of the plan; “while glacial advances and retreat can make access to the glaciers more difficult, it is a priority to continue to provide safe access at these Icon destinations” (Department of Conservation, 2014, s 1.3.11.1). While one of the key priorities of the plan is to ensure access to the glaciers, the WNPMP does include provisions to limit or close access to the glaciers in order to address adverse visitor impacts or for safety reasons. The plan also states that future access to the park must have regard to the impacts of access on the park’s historic, cultural, and natural resources, the existing natural character, and existing use and history of recreation in the area (Department of Conservation, 2014, 4.3).

Given the rapid glacier retreat at both the Fox and Franz Josef glaciers since 2008, DOC faces many challenges in providing and maintaining safe public access. The 2008 and 2014 amendments to the WNPMP reflect DOC's current interpretation of legislative and policy document requirements to foster recreation and allow for tourism. For instance in 2014, after the Franz Josef glacier became unsafe to access by foot in 2012, DOC amended policies around aircraft and road access, as well as vehicle use and glacier guiding in the WNPMP, as the original plan did not anticipate the rapid rate of glacier retreat and consequent access problems. Similar adaptive strategies have seen a significant increase in the use of aircraft in the neighbouring Aoraki Mount Cook National Park in order to maintain tourism access to the Tasman glacier (Purdie et al., 2020). There have been some concerns around the effects of aircraft noise within the glacier valleys. Until recently, the effects of aircraft noise have been monitored through visitor satisfaction surveys, which rely on visitor's subjective experience of aircraft noise within the glacier valleys. Provisions within the WNPMP aim to keep visitor annoyance towards aircraft noise below a 25 percent threshold. This threshold was decided upon following an extensive public consultation process. However, the WNPMP clearly accepts that in order to maintain access to the glaciers there will be some noise as a result: "rather than decreasing the level of aircraft activity to meet the 25% management intervention threshold…the Department will ensure that information and signage informs visitors to expect the presence of aircraft during their walk" (Department of Conservation, 2014, p. 41). DOC is currently testing a new system for monitoring aircraft noise which is less reliant on the subjective experience of visitors.

Another concern is that the volume of visitors being guided on the glaciers could reduce overall visitor experience and compromise safety. The WNPMP recognises this issue and seeks to achieve an appropriate balance for how many people can safely be on the glaciers without causing any adverse effects (Department of Conservation, 2014, s 2.1.2). Maintaining access roads to the glaciers is another key issue. Due to the dynamic environment of the glacier valleys, the access roads are frequently at risk of rockfalls, flooding, earthquakes, and melting of the underlying ice (Davies, Campbell, Hall & Gomez, 2013; Purdie et al., 2015; Sowman & Pearce, 2000). These issues are not unique to WTPNP, as Purdie et al. (2020) found that park managers in Aoraki Mount Cook National Park are also facing challenges in regards to infrastructure and aircraft activity.

Clearly DOC faces many challenges in managing visitor access to the glacier valleys, and their intention to address some of these issues has been documented in the WNPMP. However, it is unclear how DOC plans to address on-going and increasing issues around visitor access in the long-term, and whether alternative options are being explored for this dynamic and rapidly changing landscape. For this reason, this research focuses largely on the current management of safe visitor access to the Franz Josef and Fox glaciers, and identifies future options and planning mechanisms

which may help to address issues around safe access. The following chapter details how the research was conducted, who was involved, and how the data was collected and analysed.

Chapter 3

Methodology

3.1 Introduction

This chapter will provide an overview of the methods used to collect and analyse data for this research. It begins with an exploration of qualitative research methodology and techniques in order to justify the chosen methods for this research. Data collection techniques, including interview styles and sampling methods are then discussed, and a Table of key informants presented. The chapter concludes by detailing how the data was analysed, ethical elements that were considered, and limitations the research faced.

3.2 Research approach

The research adopted a case study approach to examine issues around glacier access and planning within a particular locality. The West Coast glacier region in New Zealand was chosen as an appropriate location, given the relatively easy public access to two glaciers, the Franz Josef and Fox glaciers, and the existence of a substantial glacier tourism industry in the area. The use of a case study allowed for flexibility in the type of research questions and the data collection techniques used. With case studies, data can be drawn from multiple sources, including, interviews, observations, and documents (Pearson, Albon, & Hubball, 2015).

This research adopted a qualitative research approach, primarily utilising interviews with a small number of key informants, as well as document analysis and site observations. Qualitative research generally involves studying phenomena in their natural setting and collecting opinions, meanings, and values associated with the phenomena (Hay, 2005; McIntyre, 2005). Instead of focussing on extensive data collection, qualitative research seeks intensive and in-depth information from a smaller sample size than might be found in quantitative research (Hay, 2005). This is reflected in the current research which relied on semi-structured interviews with a sample group of 9 participants.

3.3 Data collection

This research used semi-structured interviews with key informants to gather information on management of the glaciers within the national park. Semi-structured interviews allow for greater flexibility than fully structured interviews and surveys, as the researcher is not restricted to certain questions, and respondents are not restricted to ‘yes’ or ‘no’ answers (Hay, 2005). The researcher is able to follow up on points of interests outside of their pre-established questions, potentially leading to higher quality data (Hay, 2005; Schensul, 2012). Semi-structured interviews also provide a chance

for interviewees to provide feedback on the research and provide suggestions to the researcher: "The best qualitative interviews are guided not by the researchers but by the interviewees" (McIntyre, 2005, p. 222). Interview questions for this research covered topics such as: issues affecting access to the glaciers, glacier tourism and the local tourism industry, the national park plan and its various provisions, and future options that could address these issues. A copy of interview questions is provided in Appendix C.

In order to select these key informants, the research relied on purposive sampling to identify key informants involved in or with knowledge of the management of Franz Josef and Fox glaciers, based on the research team's own judgement and knowledge (McIntyre, 2005). Snowball or chain sampling was also used to identify potential stakeholders through other participants (Hay, 2005; McIntyre, 2005). The research was flexible and adopted an opportunistic sampling approach to take advantage of any new leads during fieldwork (Hay, 2005). Key informants were selected in order to access both strategic and operational perspectives at both the district and regional scales. This was done to reflect the planning framework, where regional planning tends to be more strategic and policy orientated, whereas district planning focuses more on day to day operations. Perspectives from both levels were considered necessary to fully understand planning in the glacier region. A distinction was also made between whether informants worked in a statutory or non-statutory role, as both statutory and non-statutory planning mechanisms affect the glacier region. A list of participants is presented in the following Table:

Table 1. List of participants interviewed and their involvement at either the strategic or operational level, and in a statutory or non-statutory capacity in the West Coast Glacier region.

	Geographic Area	Statutory	Non-statutory
Strategic/Policy	Regional	DOC Visitor Advisor	DOC Regional Planner
		Emergency Management Officer	West Coast Tourism Representative
		NZTA representative	
		DOC Planner	
Operational/Ground	Regional	DOC Visitor Advisor	
	District	DOC Operations Manager	CEO of Glacier Tourism company

Participants were contacted initially via email and invited to participate in the research. They were provided with an information sheet regarding the research (see Appendix A), and prior to being interviewed were asked to sign a consent form (see Appendix B). They were also be asked whether they were comfortable having the interview recorded. All participants were assigned a pseudonym to ensure confidentiality, and data was stored on a password protected computer. Interviews were conducted at a time and place agreed upon by both the particpant and researcher, this was usually a public place, an office space, or over the phone.

In total, 9 participants were interviewed. As identified by Hay (2005), the sample size of qualitative research is not as important as the quality of in-depth data collected. Although a small sample size, the data meets the traditional criteria of qualitative data saturation, that being there is no new data, no new themes, and the study can be replicated (Guest, Bunce & Johnson, 2006). However, it should be noted that the number of participants was guided by dissertation requirements for this research rather than chosen for data saturation reasons. There may, of course, be data which could further contribute to this topic but was beyond the scope of the current research.

3.4 Data analysis

Once interviews were completed, the researcher then prepared the data by transcribing the interviews. Data analysis followed two stages, referred to as 'Segmenting' and 'Assembling' by Boeije (2010). Segmenting refers to breaking down and organising the original data into categories or groups based on the data's similarities or differences to other pieces of data. This was done by using the qualitative analysis software, NVivo12. Once the various pieces of data were sorted into groups, these groups were then reviewed and organised in terms of how they related to the research questions and overall aim. Analysis then entered Boeije's (2010) second stage, assembling, where the various groups of data were assmebled to form a coherant whole. This coherent whole is presented in the following results chapters (Chapters 4 and 5).

3.5 Ethics

As qualitative research generally adopts methods involving social interaction, it is important to recognise and address any potential ethical issues and biases that may arise and develop management strategies to deal with these potential issues. Such ethical issues may concern participant privacy and confidentiality, potential psycho-social harm, and being adequately informed of research intentions (Hay, 2005).

As all participants were interviewed in their professional capacity, no human ethics approval was needed. However, participants were still asked to sign a consent form prior to being interviewed. By signing this consent form participants agreed that any information they provided could be presented in the final report. Participants also had the option of not having the interview recorded if they so desired. Participants could withdraw their consent and any information they had provided at any stage during the research. All participants are referred to throughout this final report by pseudonyms, these pseudonyms refer to their job description rather than personal names. A summary of the final report will be made available, via email, to those who have participated in the research process.

3.6 Limitations and bias

In conducting this research, it was important to be aware of my own personal biases as a researcher, including my position as a student of Lincoln University, and an outsider to the West Coast community. As an outsider I had the ability to examine this topic with fresh eyes, however, it was clear that some participants were hesitant to share their opinions because of this same reason. The research was also limited at various times by the unavailability of certain informants, and requirements of the dissertation which confined the scope of the research.

Chapter 4

Results (Part 1) – Issues

The results of this research have been organised into two chapters, the first addressing the issues, or challenges, highlighted by participants in managing the West Coast glacier region. The second results chapter looks at how agencies are responding to these issues and challenges. The issues presented and discussed in this chapter include, tourism in the West Coast region, the growth in visitor numbers and the pressure this puts on the carrying capacities of popular tourist sites, visitor safety both in the glacier region and in regards to natural hazards more generally on the West Coast, the various natural hazards affecting the West Coast glacier region, challenges to the roading infrastructure, and issues around aircraft activity in the glacier valleys. A summary of all these issues is provided at the end of this chapter.

4.1 West Coast tourism

This section discusses the importance of tourism to the West Coast region, particularly the importance of Franz Josef and Fox glaciers. Over the last twenty years the West Coast has transitioned from a predominantly commodity-oriented economy, to a more diverse one in which tourism is a key contributor. However, although many participants discussed the importance of tourism to the West Coast economy, Statistics NZ data shows that forestry, fishing, mining, agriculture, manufacturing, and construction continue to be the main contributors to the West Coast economy (Statistics New Zealand, 2020). This is not reflected in the sentiments of most of those participants interviewed for this research, with one even claiming tourism to be the "*second biggest contributor to GDP behind the Dairy industry at around $198 million*" (West Coast Tourism Representative). The economic importance of tourism to the West Coast was discussed by many participants:

> *With the decline in commodities, tourism's actually grown, so it has meant that we've been able to maintain our economic well-being (DOC Visitor Advisor).*

Participants also noted the many benefits that tourism brings, not only to the West Coast economy at large, but also to smaller "*communities up and down the coast, which brings employment and business to those communities"* (DOC Visitor Advisor).

Overall participants agreed that the Franz Josef and Fox glaciers remain the biggest drawcard for visitors to the West Coast. The fact that the Franz Josef and Fox Glaciers remain *"pretty accessible"*

(West Coast Tourism Representative), compared to other glaciers around the world was considered the main reason for their continuing popularity, as shown by the following comment.

> *…the main reason for coming to the West Coast has basically been the glaciers, the accessibility of the glaciers[…]Those are the[…]big magnets (West Coast Tourism Representative)*

Participants noted that visitor demand for, and satisfaction with glacier tourism destinations on the West Coast remains high, despite concerns about the potential impact of glacier retreat on visitor satisfaction; "*People want access to the glaciers, visitor numbers are still high"* (DOC Operations Manager). However, it was acknowledged that visitor demand in New Zealand tends to be most vulnerable not to domestic events, such as natural disasters etc., but to international events, such as the Global Financial Crisis (GFC) in 2008. Many participants noted the reduction in visitor numbers following the GFC, *"because we're relying on overseas travellers, and they stopped travelling"* (DOC Visitor Advisor). The period between 2008 and 2012 was noticeably quieter for tourism on the West Coast, but has grown since 2012 (DOC Operations Manager). These global events that affect the local tourism industry were noted to be beyond the control of local tour operators and managers; "*…you can't control it"* (DOC Visitor Advisor).

Other participants spoke about changing visitor behaviour patterns on the West Coast, particularly the increase in self-driven tourists, and freedom-campers. The impact these changing patterns have on West Coast tourism, particularly on the tourism economy, was highlighted in the following comment.

> *They're kind of realising that the visitor experience on the West Coast is primarily a free product for visitors and the increasing numbers of campervans means that there is less net-benefit from tourism for the economy. (DOC Regional Planner)*

The continuing high demand for glacier tourism on the West Coast poses many challenges, these will be discussed in the following section.

4.2 Visitor growth and carrying capacities

Visitor demand for glacier tourism on the West Coast remains high, bringing many economic benefits to the region, but also posing serious challenges in terms of environmental and social carrying capacities at popular tourist sites. This section discusses visitor growth and subsequent pressures on site carrying capacities and presents participants' thoughts on this issue.

While some participants clearly favoured the growth in visitor numbers on the West Coast and its associated economic benefits, other participants highlighted the many management challenges they are facing because of increased visitor numbers.

> *At the moment the key things are visitor numbers have increased, so the capacity of the infrastructure is getting near full, so there's visitor impacts that flow from that, managing visitor needs. (DOC Regional Planner)*

Some of the challenges of increased visitor numbers included overcrowding at popular locations such as the glaciers, infrastructure (particularly car parking) reaching capacity causing visitors to "*spill out onto the highway"* (NZTA representative), freedom camping, reduced visitor satisfaction due to increased aircraft activity and associated noise within the glacier valleys, and the social capacities of destination communities to tolerate increases in visitor numbers.

The balance between preserving iconic tourism destinations, such as the West Coast glaciers, and allowing increasing numbers of visitors to experiences these places, was most often spoken about by using the term 'carrying capacity'. Participants spoke not only of the environmental carrying capacity of a site (e.g. how many visitors the glacial environment can accommodate), but also the social carrying capacities of the communities on the West Coast (i.e. how tolerant are communities to increased visitor numbers?).

> *…more and more I think the challenge now is not just about social carrying capacity, it's about our environmental carrying capacity. This is where it gets really complex […]to manage for that growth takes a lot of long-term planning and decisions for our local communities…what's their capacity to share their generosity with visitors? […] For some it's a lifeline, for others it'll mean that their community won't be the same. (DOC Visitor Advisor)*

It was noted by a DOC Regional Planner that the carrying capacity of a site is difficult to determine and that perceived overcrowding can be quite subjective. They used the example of Lake Mathison, saying that while the car park there may seem "*fairly busy"* visitors do not necessarily perceive the attraction to be overcrowded due to the design and layout of the area and walking track. Through conducting visitor surveys DOC have found that "*the visitors are quite satisfied with the experience and crowding for them isn't a major issue"* (DOC Regional Planner).

From a management perspective, participants identified two challenges. Firstly, how do you determine a site's carrying capacity? And secondly, how do you manage a site that has reached its capacity? This is exemplified in the following comment.

> *Our challenge now as managers is that if the growth in tourism continues, and our model is we've got to protect the environment first, we've got to connect people with nature, […] and the next one is allowing the communities to thrive. But at what point do you say, we're not going to build a bigger carpark, we're not going to build more tracks? (DOC Visitor Advisor)*

Determining a site's carrying capacity, monitoring whether that capacity has been reached, and responding to overcrowding is a key challenge for a number of popular sites on the West Coast,

including the glaciers. High visitor numbers in the glacier region not only puts pressure on the sites' carrying capacity, but also increases the visitor health and safety risk, this issue will be discussed in the next section.

4.3 Visitor safety

Ensuring visitor safety is a key challenge identified both in the background literature and by participants regarding glacier tourism on the West Coast. This section explores this issue and identifies what the key concerns are, and how they are being addressed by participants.

For a long time, visitors to the glacier region were able to enjoy relatively easy and free access to both the Franz Josef and Fox glaciers. However, with *"safe, reliable foot access onto the Fox and Franz Josef glaciers no longer viable as at 2014 and 2012 respectively"* (CEO of Glacier Tourism company), access to the glaciers is "*getting harder and harder to provide from a free public access point of view*" (DOC Regional Planner). The retreat of both glaciers has not only made accessibility harder but has also increased concerns for both park managers and commercial tour operators around visitor safety.

Managing the various risks both in the glacier valleys, and in the wider area is an ongoing challenge for all those involved. The Department of Conservation is primarily responsible for monitoring risks within the glacier valleys. On a daily basis they carry out monitoring of various risks and will close the glacier valleys to visitors if necessary (DOC Planner). DOC has also conducted intensive research alongside GNS to determine the various risks and severity of those risks within the glacier valleys. Many of the glacier valley walking tracks are designed so that they end with a good view of the glacier, in order to "*prevent visitors from wanting to walk further and being exposed to hazards"* (DOC Operations Manager). Those exposed to the highest level of risk within the glacier valleys are actually the staff working there because of "*their frequent exposure to hazards in the glacier valleys"* (DOC Operations Manager).

A key challenge in ensuring visitor safety within the glacier region is around communicating risks and hazards to visitors. Communication was highlighted as an on-going challenge not only by DOC participants, but also interviewees from NZTA and Emergency Management backgrounds. They indicated that various methods were adopted to communicate risks to visitors. The use of signage to communicate risks, particularly to international visitors or speakers of languages other than English, was the most common strategy utilised by agencies on the West Coast.

> *There are challenges communicating with international visitors. Mostly we use signage to do this. (DOC Operations Manager)*

I think the way that we have been doing it, is using symbol signs rather than multi-language messages and let technology solve the rest at this stage and

people can use technology to view visitor information that would be fantastic. (DOC Visitor Advisor)

Figure 5. Signage used to communicate hazards and daily monitoring in the Franz Josef glacier valley (Emily Somerfield, 2019).

Some participants also spoke of other means of communicating with visitors, including mobile apps such as Campermate, Facebook, information websites, and radio adverts. These methods were adopted to address various risks, including track closures, road closures or delays, weather events, and other natural hazards. However, even with the use of technology, communicating risks to visitors remains a challenge, as noted in the following comment.

> *The average tourist is probably not going to listen to CoastFM or the local radio stations, probably not going to follow our Facebook page, or know about our website, or Metservice or Stuff... (Emergency Management Officer)*

Many of the concerns and challenges raised around visitor safety in this section are directly related to various natural hazards affecting the West Coast glacier region. These natural hazards, their impacts, and responses to them, will be discussed in the following section.

4.4 Natural hazards

The West Coast region is exposed to various natural hazards, with many of these directly affecting the glacier region. These hazards, the impact they have on the West Coast and the glacier region in particular, and how they are managed and responded to, will be discussed in this section.

Participants spoke of a variety of natural hazards that affect visitor access to the West Coast glacier region, including: an alpine fault earthquake, flooding, cyclones and storms, slips, and coastal erosion. The potential of an alpine fault earthquake of magnitude 8 or higher (referred to as 'AF8' by participants), is the most severe natural hazard that could affect the glacier region and was often discussed by participants. Access to the glacier valleys would be particularly impacted by such an event owing to the fault line running straight through Franz Josef township. The main issue of an AF8 event, as discussed by participants, is the potential isolation of Franz Josef and Fox townships for an extended period of time, and the community's ability to support tourists who may end up trapped there. Evacuation of tourists from these isolated townships would be the immediate priority should an AF8 or similar event occur, as shown in the following comment.

> *To address isolation, we would be working with businesses, getting the resources, the key is getting people out. This is the priority because of the high number of tourists in the area compared to residents. Evacuation either by helicopter or ship. It would be a nationwide civil defence response. (DOC Operations Manager)*

Flooding and weather-related events were also mentioned. Participants often recognised that the very nature of the West Coast environment makes it inherently prone to flooding and storm events, and management of these hazards is just part of living in the area. The 2019 wash-out of the Waiho Bridge was the most recent example of such flooding, and referenced by many participants.

> *We have issues with weather events and it's just the nature of where we are, the terrain and everything else. But the bridge washout and then the Fox glacier road being closed have sort of really highlighted how risk averse we are. (West Coast Tourism Representative)*

Figure 6. Bailey bridge rebuilt following washout of the Waiho bridge in March 2019 (Emily Somerfield, 2019).

Participants also identified aggradation of riverbeds as a contributing factor to flood risks, particularly in the case of the Waiho river which aggrades by 0.2 metres every year and has experienced significant flood events in recent years. Flooding of the Waiho is considered the number one hazard in the Franz Josef area because floods occur more frequently than earthquakes. This is a key concern not only for local civil defence staff, but also for central government who are investigating future options to manage the risk posed by the Waiho river (DOC Operations Manager).

Figure 7. Excavation of the Waiho riverbed to combat aggradation (Emily Somerfield, 2019).

The difficulty in predicting the occurrence of natural hazards was mentioned by participants. However, some discussed various surveying, hazard mapping, and monitoring work done alongside external agencies to help predict and manage events. NZTA, in particular, are extensively involved in monitoring active slips that threaten access roads, such as the main state highway; "*We do keep an eye on the known ones, but typically they're not the ones that turn around and bite us"* (NZTA Representative).

Many participants spoke of the impact that past natural hazard events have had on the West Coast tourism industry and on visitors to the glacier region. The event that participants most frequently spoke of was the wash-out of the Waiho Bridge in March 2019 and the impact this had on tourism in the area. Some of the issues noted from this event included the loss of telecommunication to Fox township in the immediate aftermath, and the economic loss. DOC estimated that this single event resulted in 100,000 fewer bed-nights over the following 12-month period (DOC Visitor Advisor). In the three weeks that access to the region was restricted it is estimated the local tourism industry lost around $50.4 million dollars in earnings (West Coast Tourism Representative). The impact of this single event is clearly explained in the following comment.

> *It was right in the middle of peak season, so the hotels and accommodation down in Franz and Fox and so on that were running at 98% occupancy suddenly went to 3% overnight. Yeah, it was massive. (West Coast Tourism Representative)*

Improving future responses to natural hazards was also discussed by participants. They talked about looking at alternative management options, building community resilience, and reducing the number of visitors to risk-averse areas. However, these comments all highlighted the balance between protecting visitors from risk while still allowing them to the area and maintaining the local tourism industry. This is shown in the following comment.

> *We've got people asking those questions but to say 'would you do something different?', not to allow access to that glacier, pretty tough on the tourism industry and it's not just this region that's going to have those catastrophic events, it's other destinations as well. (DOC Visitor Advisor)*

One area particularly vulnerable to various natural hazards on the West Coast is roading infrastructure. The threat to roading infrastructure and how risks are managed and responded to will be discussed in the next section.

4.5 Road infrastructure

Roading infrastructure is crucial not only in ensuring that tourism on the West Coast can operate effectively, but also because the roading infrastructure on the Coast is limited and at risk from various natural hazards. This section identifies how key roads on the West Coast, particularly those that allow visitor access to the glacier region, are at risk and how this risk is managed.

The importance of State highway 6 to the West Coast region and to tourism on the West Coast was highlighted by a number of participants. It is the key road which passes through all the districts on the West Coast, and in places like Westland district, most roads connect to this one highway (NZTA Representative). Reliance on a single highway means that the West Coast's highway network is inherently vulnerable to begin with, but couple with the West Coast's 'wild' weather and various natural hazards, state highway 6 is particularly vulnerable; "*The fact that there is only one highway and if something happens to it, well then, we're knackered"* (West Coast Tourism Representative).

The importance of the access roads to both the Franz Josef and Fox glaciers were also spoken about. The recent closure of the Fox Glacier access road in March 2019 (Figure 8) was a major topic and concern for many participants. Some tour operators have experienced a 90% reduction in business as a result of the road closure (CEO of Glacier Tourism Company). The road closure has meant that foot access is limited to a walk/cycle way on the south side of the valley. While participants accepted that it was infeasible to keep the Fox glacier access road open, many highlighted the importance of the

glacier access roads for the local communities and the West Coast economy. This sentiment is shown in the following comments.

> *Road and helicopter access is vitally important to the glaciers as visitors expect to be able to get as close as possible and to view which might involve a short walk. Access to the glaciers signals the region is open for business... (CEO of Glacier Tourism company)*

A DOC regional planner confirmed the importance of maintaining road access, indicating that:

> *…it is a priority for us to keep that glacier access road open because we recognise the importance of it. And there's an expectation from the community and the tourist sector that the glacier experience is maintained. (DOC Regional Planner)*

Figure 8. Signs blocking the entrance to the Fox valley access road (Emily Somerfield, 2019).

The 'wild' nature of the West Coast and the unpredictability of climatic events and natural disasters was cited as the biggest risk to road infrastructure by participants. It was acknowledged that work to protect the State highway is more reactive than proactive, largely due to the unpredictable environment on the West Coast (NZTA Representative). However, many participants supported the work done by NZTA in repairing and maintaining access to roads on the West Coast.

Of course, roads are not the only way to access the glaciers, and as glacier valley roads become increasingly inaccessible, aircraft access is gaining in popularity. The increase in aircraft activity to access the glaciers and the various challenges that this presents are discussed in the next section.

4.6 Aircraft access

As identified in the background literature, accessing the glaciers via aircraft has become increasingly popular for both Franz Josef and Fox glaciers. This section will look at the importance of aircraft access to local tour operators, the impact that increased aircraft activity is having in the area, and how these impacts are being addressed.

In response to the loss of foot access to the glaciers, the Department of Conservation increased the number of aircraft landings allowed within the glacier valleys under the WNPMP. At the moment, aircraft landings are the only way to access the glaciers. DOC is responsible for managing aircraft landings and does so through its concessions system. This approach is explained in the following comments.

> *We've got a sort of aircraft landing zone approach in the park, and there's limits on the number of landings within each zone. I guess that's sort of an allocation, limited supply process, so there's only a certain number of landings that can happen in certain zones. (DOC Planner)*

> *The current management landing cap is based on the number of aircraft that can land in the park at any one time. (DOC Visitor Advisor)*

Aircraft access was considered vital to maintaining both visitor satisfaction and the economic viability of local tour operations. Until 2012, guided glacier walks accounted for a large percentage of tour operator's income (CEO of Glacier Tourism company). As a result of diminishing foot and road access to the glaciers in 2012, DOC "*made the call to increase the number of aircraft landings that could land on the glacier…that kept those guiding businesses alive"* (DOC Visitor Advisor). However, DOC has made it clear that the number of aircraft landings will not be increasing in the future, and it appears that both DOC and tour companies accept this reality.

> *There's no more aircraft landings. So, the glacier guiding companies have accepted that cap. They haven't sought anymore even though they could potentially...there's more visitors coming…they're comfortable with their limit. (DOC Visitor Advisor)*

The biggest issue with increased aircraft access to the glaciers was the increased noise levels within the glacier valleys. Noise within the glacier valleys has been monitored by visitor satisfaction surveys since 2013. Using this method, 25% of surveyed visitors had to be dissatisfied with the level of aircraft noise within the glacier valleys. Following the allowance of increased aircraft activity, a survey found visitor dissatisfaction had increased to 26% (DOC Visitor Advisor). Most participants believed aircraft noise was unavoidable, and just something that has to be put up with in order for glacier tourism in the area to continue (West Coast Tourism Representative; CEO of Glacier Tourism

company). To try and combat visitor dissatisfaction, DOC *"pushed information about helicopters so that visitors expect them and aren't annoyed"* (DOC Operations Manager).

A new method of monitoring aircraft noise is being tested through the upcoming draft park plan. Using a technology called Soundscape, the level of noise within the valleys would be monitored according to decibel readings rather than subjective visitor experiences (DOC Planner). It is believed that this method might be easier to explain and justify to the public than subjective visitor satisfaction surveys (DOC Visitor Advisor).

Aircraft access is one of the many issues that have been discussed in this chapter. In order to bring all of these issues together a summary of these various issues is provided in the next section.

4.7 Summary of results (part 1)

Tourism is the second biggest contributor to the West Coast economy, with glacier tourism remaining the strongest drawcard for visitors to the region. Visitor demand for glacier tourism remains high, and in the past, this demand has only been significantly affected by uncontrollable global events, such as the global financial crisis in 2008. Continuing visitor demand and growth in visitor numbers is raising concerns about both the environmental and social carrying capacities of some iconic tourism destinations on the West Coast, such as Franz Josef and Fox glaciers. Alongside this, safe access to the glaciers is getting harder to provide as the glaciers retreat and foot access is no longer tenable. One of the main challenges here is communicating and informing visitors of the safety risks in the glacier areas. A range of other natural hazards also threaten access to the glacier region, including, earthquakes, flooding, and storm events. A lot of work is being done to predict, map, and monitor these events. Participants spoke of the Waiho Bridge wash-out in March 2019, and the impact this had on the local tourism industry. State Highway 6 was highlighted as a crucial yet vulnerable link throughout the West Coast, as were the glacier valley access roads. The closure of the Fox valley access road and the impacts of this on local tourism operators were also discussed. Many of the risks posed to roading infrastructure were seen as unavoidable given the nature of the West Coast, and just something that had to be lived with. Increasing aircraft landings in the glacier valleys in response to the Fox road closure was also discussed, as was how to monitor and manage the subsequent increase in aircraft noise within the valleys.

Chapter 5

Results (Part 2) – Response

This second results chapter looks at how agencies are responding to and managing some of the issues discussed in Chapter 4 within the West Coast glacier region. This chapter looks at the statutory planning response, primarily the Westland *Tai Poutini* National Park Management Plan, as well as non-statutory planning responses.

5.1 Statutory planning response

The primary planning document responsible for the glacier region and visitor access to the glaciers is the Westland *Tai Poutini* National Park Management Plan (WNPMP). This park plan is prepared by the Department of Conservation and sets down objectives, policies, and rules around activities within Westland *Tai Poutini* National Park. A review of the park plan is currently underway in conjunction with a review of the Aoraki Mount Cook Park Management Plan. However, the review process for the new draft park plan was put on hold on February 4th, 2019 due to larger national discussions with Ngāi Tahu (DOC Planner). The draft plan is expected to come off pause sometime within the first half of 2020[1].

Discussions with participants further explored the purpose of the draft WNPMP, certain legislative requirements that place restraints upon what issues the plan can address and how it can address them, as well as public involvement and consultation on the plan, and collaboration with other agencies while developing the draft plan. As a 'relatively' high-level statutory document, the WNPMP provides overarching guidance for activities within the park, rather than specific operational details (DOC Planner). As previously explained, the WNPMP must take into account legislative requirements of the National Parks Act 1980, as well as policy direction from the General Policy for National Parks, and the West Coast Conservation Management Strategy (WCCMS). The requirements of these higher-level policy documents means that the WNPMP has limits to what it can and cannot control within the park boundaries, as explained in the following comment by a planner from DOC.

> *We do have legislative requirements of what can and can't happen in the park plan, so any sort of long-term visions or discussions that's happening for the glaciers, we just have to be quite mindful that it actually can happen within a national park. (DOC Planner)*

The process of reviewing the WNPMP involved collaboration between DOC, Ngāi Tahu, and the West Coast *Tai Poutini* Conservation Board. The public were also consulted on the draft plan through

[1] This now may be affected by delays caused by the COVID-19 situation.

specific stakeholder meetings, with agencies such as NZTA and Civil Defence, and public consultation workshops. Overall, around 1400 submissions were received on the draft plan; "*there's been quite a lot of interest, and people have been quite engaged in the process, which has been great*" (DOC Planner). The final document will eventually be signed off by the New Zealand Conservation Authority.

Conducting a complete review of the WNPMP was considered not only a way to update existing park management practices, but also a way to test new management ideas, such as Soundscape technology to monitor aircraft noise, and a gondola to provide long-term access to the glacier valleys. Such ideas are presented in the draft plan as a 'discussion box' in order to elicit public feedback on them without fully committing to their implementation; "*It's a discussion box, it's not a final 'this is where we're heading'[…] We're testing it with the wider community and stakeholders"* (DOC Planner). This method of 'testing the waters' is a planning tool often adopted by the Department, *"particularly with ideas that are maybe quite different or take quite a different approach to what's in the current plans…It's a good way to test the water on quite a drastic change of policy direction"* (DOC Planner).

Since the draft WNPMP was paused, the situation around access to the glaciers has changed considerably. Participants referred specifically to the wash-out of the Waiho Bridge and loss of road access to the Fox Glacier valley in March 2019. They acknowledged that the draft park plan may need to change in light of these new access issues. "*When we wrote it, we had access to both valleys. It's the first time we've lost access to valley […] It's new territory [...] we've got to look at the alternatives"* (DOC Visitor Advisor). Participants spoke of perhaps changing provisions in the park plan around aircraft landings "*to reflect that change in circumstances with the closure of the Fox"* (DOC Planner).

It should be noted that the WCCMS is also currently undergoing an amendment process which was initiated in March 2019. The amendment to the WCCMS was to accommodate provisions in the Paparoa National Park Management Plan for the new Paparoa Track and Pike29 Memorial Track. However, the amendment process was halted due to concerns raised about the process being followed. While participants did not seem concerned that amendments to the WCCMS would affect the WNPMP, it is worth being aware that further changes may need to be made to the WNPMP should the WCCMS be substantially changed.

5.2 Collaborative action

Participants also discussed the importance of inter-agency collaboration in addressing the various issues affecting visitor access to the glaciers on the West Coast. Inter-agency collaboration was mostly referred to in the context of natural hazard and emergency management. In the case of

preparing for an AF8 event, participants spoke of how civil defence, local and regional councils, and various stakeholders from the agricultural, tourism, and forestry sectors had all come together to discuss and prepare for the possible scenario (West Coast Tourism Representative). DOCs work with the likes of GNS Science was referred to by a number of participants as an example of co-ordination between various agencies in the area of hazard management; *"The Fox glacier is a good example where those two organisation were used together to identify the risks"* (DOC Regional Planner). Ensuring effective communication between these different agencies was also considered important by participants; *"Extensive work has gone on behind the scenes to have all agencies aligned with open lines of communication and a forum to address issues and to plan and act for future events as they arise"* (CEO of Glacier Tourism company). As the key Civil Defence team on the West Coast is based outside of the glacier area, communication between West Coast Civil Defence and other agencies like the Department of Conservation, Welfare groups, NZTA, and Lifeline is vital (Emergency Management Officer).

In terms of statutory and non-statutory planning processes on the West Coast, participants spoke of collaboration between DOC, Ngāi Tahu, Councils, aircraft authorities, and other interested parties. Sharing knowledge and experiences both within agencies, such as DOC, and between agencies is an important approach recently adopted by DOC to address issues around glacier access; *"we're getting a much bigger holistic picture of the options and expertise about what we could do*" (DOC Visitor Advisor); *"It's working with the other agencies that are looking across the whole spectrum of tourism, so infrastructure, and visitor journey"* (DOC Regional Planner).

Many participants also mentioned how crucial the New Zealand Transport Authority is on the West Coast. NZTA and DOC work closely together to manage roads within the glacier region. Even though the glacier valley access roads are under DOC's jurisdiction, they do still work alongside NZTA in this instance. NZTA appears to be involved in various collaborative arrangements with the likes of the Department of Conservation, district and regional councils, and tourism operators. Again, collaboration between agencies was highlighted as crucial for sharing knowledge and generating alternative solutions, as demonstrated in the following comment.

> *We're meeting with NZTA and the local transport board, and we're talking together, again it's that collaborative sharing of knowledge, identifying the risks and the opportunities that highway provides, obviously it's a critical link for this region. We're now sharing knowledge about where we could shift regional tourism. (DOC Visitor Advisor)*

This shift in regional tourism was discussed by almost all participants in regard to addressing some of the issues around visitor access to the glaciers, and in particular the issue of carrying capacity. Such a

shift, however, is beyond the scope of the WNPMP and therefore has been addressed by non-statutory planning mechanisms as detailed in the following section.

5.3 Non-statutory planning response

At the time of conducting this research DOC was developing a long-term visitor strategy to address issues such as overcrowding and site carrying capacity in the glacier region. The strategy is a high-level document that looks at the 'visitor journey' and experience through the West Coast region, and potentially how visitors can be dispersed more evenly across the coast. The following comment explains the rationale behind the new visitor strategy, and the purpose of the document.

> *Visitor numbers have increased, so the capacity of the infrastructure is getting near full […] if we step outside of the two glacier areas then its looking at the whole visitor journey in South Westland. And if we're going to look long-term, what are the opportunities for that visitor journey, because it's still likely that tourists will want to experience the West Coast. (DOC Regional Planner)*

This visitor strategy is a non-statutory document, in that there is no legislative requirement for it to be developed, however, after talking to participants it became clear that this new piece of work would be crucial in future management of visitors within the glacier region. Statutory planning is looking towards this new visitor strategy in the hopes that it will provide and test some ideas for future management of the glaciers. Statutory documents, such as the WNPMP, are restricted by their statutory requirements, whereas the new visitor strategy has more flexibility in what it can address. Other DOC planners were eager to see what the new visitor strategy may come up with, and how it could be incorporated into the WNPMP, as shown in the following comment.

> *It's really useful for us that the document's not statutory, whereas ours is a statutory document, so that's quite a good distinction to make. The work is 30 years ahead, so it's very strategic, thinking big picture. We're hoping that our work, we can collaborate quite a lot and get a lot more of that long-term thinking coming out of that process […] I think that will help inform the future thinking for the park plan. (DOC Planner)*

However, a challenge for the new visitor strategy is that it must project out and provide a plan for the next thirty years. Many participants highlighted the challenge of planning for thirty years in the future. At the moment, the visitor strategy breaks up this timeframe into the short, medium, and long-term future. For the short- and medium-term DOC will assess the current state of the environment and use available data to forecast future visitor demand and needs over that period of time. For the long-term, the visitor strategy applies a 'vision' of how they want things to be, and how they might influence visitor behaviour towards this vision, rather than forecasting what visitor demands might be; *"it's taking control of the situation"* (DOC Regional Planner).

Other challenges for the new visitor strategy include reaching consensus with other stakeholders over what the long-term vision for tourism on the West Coast should look like, and how to achieve this vision. Treaty partners were the first to be brought into conversations around the visitor strategy; *"ideally we wouldn't really want to go into stakeholder consultation until we've got an understanding of what they want, what their aspirations are"* (DOC Regional Planner). Other stakeholders for the visitor strategy have been identified largely through the National Park planning process and those who have submitted on National Park plans, such as the WNPMP. There are also questions around funding for this future vision and how to align investment decisions with the aim of the visitor strategy; *"The downfall of the final plan will be if it doesn't have funding then nothing will happen"* (DOC Regional Planner).

One of the ideas being explored in the new visitor strategy is that of tourism dispersal, or 'spreading the load' of tourism throughout the West Coast, rather than just the hubs of Franz Josef and Fox Glacier. This idea will be explored in more depth in the following section.

5.4 Tourism dispersal

The idea of tourism dispersal was originally promoted by Tourism Development West Coast's Six Icon destination strategy. These Six Icon destinations are also used in the West Coast Conservation Management Strategy, where they are referred to as 'intense interest sites' (DOC Visitor Advisor). These six icon destinations are as follows:

> *So, we've got the Oparara Arches which are way up the top in Karamea, we've got Punakaiki Pancake rocks, we've got Lake Brunner, Hokitika gorge, the glaciers, and the Haast World Heritage Area. And the idea is to try and get dispersal across the coast. (West Coast Tourism Representative)*

The idea of dispersing tourism more evenly across the Coast is not a new idea and has been discussed over the years by various agencies. One of DOC's first attempts at dispersing visitors was to create a new visitor destination at the Hokitika Gorge; *"That was our first thinking […] where could we create a new domestic and international destination that would slow people down and give them […] a world-class experience of the region, spread the load, and benefit Hokitika"* (DOC Visitor Advisor). Most of the participants were in favour of dispersing tourism more evenly across the West Coast region, both to encourage visitors to stay in the region longer and generate more income from tourism, and to lessen visitor impacts at already popular sites such as the glaciers.

> *Need to spread tourism over the year, over seasons, and over the region. We need better collaboration across the coast and to encourage visitors to stay for longer. (DOC Operations Manager)*

While DOC's new visitor strategy may take a different approach to this Six Icon destination strategy, it certainly takes inspiration from some of the ideas; "*We're definitely trying to tap into that hub model that they wanted to create"* (DOC Regional Planner). One of the key challenges in planning for tourism dispersal, however, is identifying where to shift tourism. As mentioned above, the Six Icon destination strategy provides certain guidelines of where tourism could be dispersed. However, identifying potential areas which could attract visitors is only part of the challenge, consideration also needs to be given to the impact of increased tourism on local communities, walking tracks, toilets, infrastructure, car parks, and even whether *"the road is suitable for carrying the extra volume of traffic"* (DOC Visitor Advisor). One of the guiding questions in deterring new visitor destinations is *"is there somewhere else […] where we could create a destination with those elements that visitors want and where the community are willing to accept the change?"* (DOC Visitor Advisor). There is currently no model for dispersal in the new visitor strategy, with discussions ongoing about what dispersal would mean for the West Coast, whether more camping sites are required, whether recreation values are being encroached upon, and so on (DOC Regional Planner).

Participants also discussed linking tourism dispersal more effectively across regions, and better understanding the visitor journey across different regions. Many of the nearby popular destination sites in neighbouring regions, such as Aoraki Mt Cook, Milford Sound, and Wanaka, are also reaching visitor capacity, indicating that this issue is not unique to the West Coast region. There is the potential for greater collaboration between regions in order to address issues of overcrowding and carrying capacity at popular destination sites.

5.5 Summary of results (part 2)

The key planning document addressing access to the West Coast glacier region is the Westland *Tai Poutini* National Park Management Plan. A review of this plan is currently on pause but is expected to be enacted later in 2020. The plan is relatively high-level, strategic focussed, and bound by statutory requirements. However, the draft plan is testing out new ideas such as Soundscape technology to manage aircraft noise within the glacier valleys, and potential long-term access options to the glaciers, such as a gondola. Where the WNPMP is perhaps restricted by certain legislative requirements, there is also work being done on non-statutory planning documents to manage visitor growth and demand in the region. The new visitor strategy being developed by the Department of Conservation is particularly interested in the idea of tourism dispersal, or spreading tourism more evenly throughout the West Coast. This strategy is still being developed and there remain many issues to be overcome, however, it could provide a pathway forward in the future management of access to the glacier region. If tourism dispersal is the desired outcome of this new visitor strategy,

the high levels of inter-agency collaboration on the West Coast indicate that people are willing to work together and share ideas to achieve their collective vision.

Chapter 6

Concluding Discussion

This chapter will discuss each of the original research objectives with reference to the research findings and relevant literature. The research findings will be placed within the broader literature on glacier tourism, visitor access, and planning. Possible areas for future research on this topic, and of the various limitations of this research will also be discussed. This chapter will conclude with a brief examination of how COVID-19 has impacted tourism on the West Coast, as well as tourism in New Zealand more generally, and what impacts and implications this may have for tourism and visitor access planning.

6.1 Revisiting the research questions and literature

To begin, the original objectives of this research will be addressed in light of the findings laid out in chapters 4 and 5 as well as relevant literature. The first objective was to understand how planning stakeholders are negotiating the tension between tourism development and conservation management at the glaciers.

6.1.1 Objective 1. Tension between conservation and tourism

The tension between tourism development and conservation management can be most readily seen in the Department of Conservation's sometimes conflicting statutory responsibilities to preserve national parks in their natural state, while also allowing for their public use (Booth & Simmons, 2000; Sowman & Pearce, 2000). In the glacier region where Franz Josef and Fox glaciers are highly susceptible to the changing climate, yet also crucial to the local tourism industry, striking a balance between conservation and tourism, or preservation and use, can be a delicate challenge. West Coast tourism is heavily reliant on the West Coast's natural environment, particularly the glacier region, and tourism itself is important to the larger West Coast economy, contributing $276 million to the West Coast's GDP, and employing 22.5% of the West Coast population in 2019 (Infometrics, 2019). As the West Coast economy is so dependent on the continuation of tourism in the glacier region, there is an economic incentive to protect the unique natural environment, including the glaciers themselves, which exemplifies Budowski's (1976) notion of a symbiotic relationship between conservation and tourism. However, if access to the glaciers becomes infeasible due to ongoing glacier retreat, tourism dependent communities such as the West Coast may exert political pressure to benefit from natural resources in ways that may conflict with current conservation goals (Stewart et al., 2016).

As has been made clear by participants in this research, tourism is continuing to grow on the West Coast, with a steady increase in visitor numbers expected well into the future. This may increase the economic benefits of tourism, but such growth needs to be managed in a way that protects the environment on which such tourism ultimately depends. The growth in visitor numbers puts pressure on the natural environment, including the glaciers, in various ways. For example, increased visitor numbers mean increased carbon dioxide emissions from travel (e.g., vehicle and aeroplane emissions), which contribute to further warming of the Earth's atmosphere and accelerate glacier retreat. Visitor growth also places pressure on tourism infrastructure to accommodate such growth, including accommodation, road maintenance, car parking, camping sites, walking tracks, and so on. The construction and maintenance needed in these areas to provide for visitor growth may also have impacts on the natural environment.

Another often overlooked impact of visitor growth is the pressure placed upon local communities, both in terms of local infrastructure capacity, but also the social capacity, or tolerance, of local communities towards visitors. Research by Simmons (1994) suggests that residents often fear the 'loss of control' over their local areas in regard to tourism investment, subsequent development, changes to their way of life, and visual and environmental impacts of tourism development. To address these concerns, Simmons (1994) calls for greater public participation in tourism planning and suggests that public participation in planning processes be encouraged by increasing residents' awareness of the benefits of tourism, and of how the tourism industry works. Statutory planning processes, such as those followed in the WNPMP, enable mechanisms for public participation, and alongside community-based approaches can provide a broader perspective on tourism planning (Simmons, 1994).

Agencies on the West Coast are currently addressing issues around visitor growth through the concept 'carrying capacity'. In this context, carrying capacity refers to the number, distribution, and behaviour of visitors a site can accommodate without undergoing irreversible change. The term is multi-dimensional and can be applied to various areas, including physical carrying capacity, socio-cultural carrying capacity and economic carrying capacity (Zelenka & Kacetl, 2014). It is thought that some visitor destinations on the West Coast, including Franz Josef and Fox glaciers, have reached their carrying capacity. Carrying capacity is a key concern for managers, particularly those involved with DOC's long-term visitor strategy. They need to be able to determine what a site's carrying capacity is, whether it has reached that capacity, and if a site has reached capacity, how can the pressure on that site be lessened? Dispersing tourism more evenly across the West Coast was suggested by participants of this study as a way to lessen the pressure on popular destination sites, such as the glaciers. However, tourism dispersal as a strategy still relies on specific details about carrying capacities; how do you determine, measure, and manage a site's limits? How do you know if

visitors need to be dispersed to other locations? Some studies even question whether a numerical carrying capacity for tourism destinations can realistically be established and applied in the real world (McCool & Lime, 2001). If it is decided that the glaciers have reached their capacity for visitor numbers, and visitors are instead encouraged to go to an alternative site, the flow-on effects of such decisions should be examined, and the carrying capacity of the alternative site should also be known and actively monitored.

This is not to say that studies of carrying capacity are not already in place on the West Coast. In fact, questions around carrying capacity can perhaps be answered by examining aircraft activity within the glacier valleys. In response to the loss of foot access to both glaciers, the WNPMP was amended to allow for increased aircraft landings within the glacier valleys. Changing policies around aircraft access meant that access onto the glaciers could be maintained, and local tourism operators could continue to profit from glacier tourism. With the increase in aircraft activity came an increased concern about visitor satisfaction and 'natural quiet' within the glacier valleys; here we see the tension between tourism development and conservation management in action. In response to these concerns, visitor satisfaction surveys were conducted to determine levels of visitor annoyance with aircraft noise. A 25% aircraft noise threshold was determined after extensive public consultation, and should this threshold be exceeded then DOC will take action to remedy the issue. Here, we can clearly see how some of the challenges around a site's carrying capacity have been addressed. The site's carrying capacity in relation to aircraft noise was set at 25%, and then monitored through visitor surveys. If the management strategy for aircraft noise has proved successful, could similar strategies be applied to other aspects of carrying capacities at other sites on the West Coast?

6.1.2 Objective 2. Visitor access

The second objective of this research sought to document how stakeholders currently plan for, maintain, and address challenges relating to safe visitor access to the glaciers of Westland *Tai Poutini* National Park, whilst meeting tourism, community, and conservation needs. As the findings presented in Chapter 4 suggest, safe visitor access to the West Coast glaciers is a multi-faceted issue that is affected by more than just glacier retreat. While glacier retreat affects visitor access to the glaciers by increasing the hazard risks within the glacier valleys, (e.g., increasing the risk of rockfall, and the instability of the glacier ice), access to Franz Josef and Fox glaciers appears to be impacted by wider issues throughout the West Coast region. The main issues affecting visitor access to the glaciers as highlighted by participants were the possibility of an alpine fault earthquake, flooding, and road closures. It is worth briefly recapping on the impacts that each of these issues has on safe visitor access to the glaciers, and how these issues are being responded to and managed to ensure safe visitor access.

Direct access onto the glaciers is mainly affected by glacier retreat, which, as documented in other studies, can cause the glacier terminus to become unstable and increase the risk of rockfall within the glacier valleys (Purdie et al., 2015). To combat these issues, DOC currently monitors both the Franz Josef and Fox glacier valleys on a daily basis to identify potential risks. From this monitoring they are able to determine how close visitors can get to the glacier on a given day; this distance can be modified to suit conditions. DOC has also conducted research alongside GNS to identify and map hazards within the glacier valleys, and to determine the level of risk to visitors. Signage is also used throughout the glacier valleys to alert visitors to the various risks, and walking tracks have been purposely designed so that they end with a satisfying view of the glaciers, in order to deter visitors from venturing further into potentially dangerous areas. DOC has also allowed for increased aircraft access into the glacier valleys to alleviate the impact on local tourism operators, as direct foot access onto both glaciers has become infeasible.

Potentially the most catastrophic impact on safe visitor access to the West Coast glaciers is a future alpine fault earthquake event. Research suggests that the Alpine fault has a 20% chance of rupturing in the next 30 years (Langridge & Beban, 2011). As the alpine fault runs directly through Franz Josef township, the area would be significantly affected should such an event occur. It is expected that both Franz Josef and Fox Glacier townships would be isolated for an extended period of time. As these areas have high numbers of visitors at any given time, resourcing is a major issue, as these communities would be required to accommodate and provide for an uncertain number of visitors for an uncertain length of time. The AF8 project directly responds to this issue, and aims to bring communities together to plan for such an event, to identify community persons with essential skills, to address resourcing issues, and to plan for the evacuation of visitors from the area should such an event occur. While glacier access is not currently impacted by an alpine fault event, there is the potential that it may be in the future, and therefore should be a consideration when making plans about safe visitor access to the glaciers.

One of the most pressing issues affecting not only access to the glaciers, but the viability of Franz Josef township itself, is flooding. The Waiho River was a concern discussed by participants, particularly as the March 2019 washout of the Waiho Bridge was still fresh on everyone's minds. The importance of the Waiho Bridge in connecting areas of South Westland to the rest of the region was reflected in the impressively quick construction of a replacement bridge in March 2019. Without a connection across the Waiho River, the visitor journey through the West Coast would be disrupted and visitors may potentially not be able to reach the glacier region. The ongoing aggradation of the Waiho riverbed, and ever-increasing likelihood of a significant flood event is considered a major flood risk (Davies et al., 2003), and has seen Central Government investigate potential options for the

future. One drastic option being discussed is completely relocating Franz Josef township away from its current location by the river.

As highlighted above, there are severe vulnerabilities to the roading network on the West Coast which have the potential to significantly affect visitor access to Franz Josef and Fox glaciers. As the West Coast is ultimately reliant on a single highway throughout most of the region, tourism is inherently vulnerable to road closures on this highway. Due to the nature of the West Coast environment, State Highway 6 is frequently at risk of slips and coastal erosion. Risks to the highway are actively monitored and responded to by NZTA, and many participants noted the quick work of NZTA in responding to these issues. However, many participants demonstrated a blasé attitude towards this issue on the West Coast, simply accepting the ongoing maintenance of the State Highway as part of normal life on the coast. This is consistent with previous studies both on the West Coast and in remote New Zealand communities in which residents had chosen to accept or tolerate the risks of certain natural hazards (Espiner & Becken, 2014; Gough, 2000). The closure of the Fox glacier access road, however, is far from normal for glacier tourism operators, local communities, and visitors alike. While participants accepted that reopening the road was not feasible, all noted that the closure would have a significant impact on the local community and on free public access to the Fox glacier. As the WNPMP has been on pause since before the road closure, it is unclear how the plan may be amended to address reduced access to the Fox glacier valley, and whether policies on aircraft access may be altered in order to increase access to the glacier.

One alternative option to address reduced access to Franz Josef and Fox glaciers, is the construction of a gondola in the Franz Josef valley. This option is being proposed in the new draft WNPMP in order to get public feedback, and is already proving to be quite a divisive idea (Radio New Zealand, 2019, March). While a gondola may address concerns around aircraft noise and carbon-intensive tourism, it also raises concern about impacts on the surrounding natural environment, particularly during construction of the gondola, and whether the gondola infrastructure could adapt to future bio-physical changes of the glacier. Other options are also being investigated by DOC's long-term visitor strategy, which is being developed in part to respond to the reduced accessibility of the glaciers.

6.1.3 Objective 3. Future Options

The final objective of this research was to identify future options and planning mechanisms to help stakeholders address any potential consequences of diminished visitor access to the glaciers of Westland *Tai Poutini* National Park. From interviews with participants, four areas emerged which offer possible ways forward in planning for visitor access to Franz Josef and Fox glaciers, these are the new draft WNPMP, collaboration efforts between agencies on the West Coast, DOC's new long-

term visitor strategy, and tourism dispersal. The pros and cons of each of these will be discussed in turn below.

New ideas around visitor access to the glaciers are being discussed in the new draft WNPMP, including the proposal for a gondola in the Franz Josef valley, and the adoption of Soundscape technology to better monitor the effects of aircraft noise within the glacier valleys. Both of these new ideas have been presented as 'discussion box' ideas in the WNPMP in order to get public feedback. The ability of the WNPMP to be able to test these ideas without fully committing to their implementation is one of the strengths of this plan, and exemplifies the ability of statutory planning processes to enable public participation (Simmons, 1994). However, since the draft plan has been on pause, road access has been lost to the Fox glacier valley, posing a significant challenge for visitor access, especially from a free public access point of view. It is likely that provisions within the new WNPMP will be amended in some way, perhaps to allow increased aircraft activity to compensate for the loss of road access. At the time of writing, it remains unclear how or if the WNPMP will change in light of the road closure. There is also the potential for the COVID-19 situation to further delay the plan, but specific impacts are so far unclear.

Many participants also highlighted the high levels of collaboration both within and between agencies and communities to address challenges around visitor access to the glaciers. Parties frequently referred to in this context included, DOC, local and regional councils, emergency management and civil defence, Ngāi Tahu, West Coast tourism operators, and NZTA. Previous studies of the West Coast glacier country have also noted the small, cohesive character of the West Coast community, and suggest that the region's frequent exposure to natural hazards has strengthened relationships within the community, adding to increased resilience and collaboration (Espiner & Becken, 2014). Bringing together knowledge and experience from a broad range of areas allows decision-makers to develop a holistic picture of what is going on regarding visitor access to the glaciers as well as the visitor journey throughout the West Coast more broadly. Collaborating in this way can bring together knowledge around visitor planning, hazard management, and infrastructure provision to see how they interconnect and to develop options for future access to the glaciers. Given that section 6.1.2 of this chapter noted that visitor access to the glaciers is a multi-faceted issue, it seems appropriate for the response to this issue to be equally multi-faceted. This perhaps suggests that collaborative planning may lead to innovative ideas around future access to the glaciers. A study by Welling and Abegg (2019) likewise suggests that decision-making about responses to glacier retreat could be improved by establishing good cooperation between the tourism sector, land-use management, and the scientific community.

Responses to diminishing visitor access to the glaciers are being investigated as part of DOC's long-term visitor strategy for the West Coast, which is still in development at the time of writing. This non-statutory strategy has more flexibility in the scope of what it can address and a long-term timeframe, rather than most statutory documents, such as national park plans which focus on a 10-year period. Whereas the WNPMP can only address visitor access issues directly within the national park, the strategy looks at the entire visitor journey throughout the West Coast and aims to create a 30-year vision of what tourism on the West Coast should look like, and where it should occur. It has the ability to address issues around carrying capacities, particularly at the glaciers, while also steering towards a long-term vision for tourism on the West Coast, a vision that DOC can craft and control in order to meet its dual responsibilities to preserve and allow for public use of protected areas, such as Westland *Tai Poutini* National Park. The idea of dispersing tourism more evenly throughout the West Coast is also being explored by the strategy and may hopefully provide some guidance on how and where tourism dispersal may occur.

Tourism dispersal has long been discussed as a potential option for tourism on the West Coast. It is an idea that is shared across various agencies, suggesting that it would have wide support if implemented, and has already proven successful in the past with the likes of the Hokitika gorge. Spreading tourism more evenly throughout the West Coast, as noted earlier in this chapter, would lessen the pressure on popular destinations such as the glaciers, and disperse the economic benefits of increased visitor numbers more widely. Though some models have been put forwards for tourism dispersal in the past (Stewart, Glen, Daly, O'Sullivan, 2001), there is no single framework or model to guide tourism dispersal on the West Coast at the present time. The idea obviously needs further examination, discussions particularly need to be had with local communities to see if they would support the idea. There is perhaps an opportunity for more integrated planning approaches to be used in this area, bringing together statutory planning process, community-based approaches, and non-statutory planning mechanisms to work alongside communities and develop tourism in ways that they desire and support (Simmons, 1994). There is also potential to better disperse tourism across regions and look at the visitor journey across the entire South Island, rather than within a single region. Given that there is no official model for tourism dispersal, the COVID-19 situation may provide planning decision-makers the time needed to investigate and develop such a model.

6.2 Implications of research

While these findings are interesting in themselves, they also offer valuable contributions to the wider discussion around how to respond to glacier retreat, how to manage visitor access to glacier areas, and how to plan within a dynamic environment.

On a broad level, the risks and opportunities in planning for visitor access to ever-changing glaciers exemplifies the challenges of planning in a dynamic environment. Two findings of this research may help decision-makers plan for and manage dynamic environments. The first is that high levels of collaboration between statutory, non-statutory, and community-based agencies, may reveal a more holistic picture of the situation, and help develop possible adaptation strategies for the future. The second finding is that non-statutory planning mechanisms may have more flexibility to address ongoing biophysical changes, particularly in glacial areas, and may therefore, complement statutory processes and their associated public participation mechanisms.

This research identified that there are a number of ways in which decision-makers are responding to glacier retreat and consequent challenges around visitor access to glacial landscapes. Both statutory and non-statutory planning mechanism have been employed to address the issue, with the statutory park plan testing new ideas for direct access onto the glaciers (e.g., a gondola), and non-statutory planning looking beyond the immediate glacier area to see how the wider tourism landscape could be changed in response to diminishing visitor access to the glaciers (e.g., DOC's Long-term visitor strategy). Perhaps an integrated response of both statutory and non-statutory planning mechanisms alongside community-based approaches, will increase the adaptive capacity of the planning sector to respond to ongoing changes around visitor access to Franz Josef and Fox glaciers. Other studies have suggested a similar approach, with Espiner and Becken (2014) favouring a flexible, inclusive, and accountable governance structure for responses to ongoing changes within protected areas.

If glacier tourism industries around the world seek to maintain visitor access to retreating glaciers, perhaps, as these research findings suggest, a multi-faceted, integrated planning response should be employed. As this research found, glacier retreat is not the only issue affecting visitor access to the West Coast glaciers, and given that most glaciers are located in mountainous, often marginal land, it is likely that access to other glaciers is also impacted by wider issues, such as earthquakes, flooding, and poor roading networks. That is not to say that visitor access is impacted in the same way at other glaciers as it is on the West Coast, but that contextually appropriate, multi-faceted approaches to managing visitor access may be the best way forward. Integrating planning responses to glacier retreat and diminished public access, by aligning statutory, non-statutory, and community-based approaches, could allow decision-makers to produce outcomes that address a range of visitor management issues.

6.3 Future Research

Naturally, there were various points of interest in relation to glacier tourism and visitor access planning that could not be addressed by this research due to time constraints, and the overall requirements of a dissertation. The research was also limited by the unavailability of some

participants, and the small sample size of interviewees. Future studies could easily expand the scope of the current research and investigate further areas of interest. Some potentially interesting areas for such future research could be to examine how statutory and non-statutory planning mechanisms interact within the West Coast glacier region, or to compare the planning responses to glacier retreat and diminishing visitor access on the West Coast with planning responses in other countries. Are there lessons from overseas that could be applied to management of the West Coast glaciers? As noted in the previous sections, there is still a lot of research needed to develop a framework or model to guide tourism dispersal on the West Coast; this too could be an interesting area for future research. There are also issues around carrying capacity, as previously noted, such as how to determine a site's carrying capacity, and how to monitor a site's limits, that could benefit from further investigation.

6.4 Impacts of COVID-19

There is considerable scope for future research to examine how the COVID-19 pandemic has impacted visitor access planning to the West Coast glaciers. As the COVID-19 situation emerged after primary data collection for this research had been completed, the impacts of COVID-19 have not been fully examined in the current research. This final section outlines developments of the COVID-19 pandemic in relation to glacier tourism on the West Coast and briefly addresses potential impacts and opportunities on visitor access planning as a result of the crisis.

Research participants noted that visitor numbers to the West Coast are most affected by global events such as the global financial crisis in 2008. This same trend is evident with the COVID-19 pandemic, with international visitor numbers to New Zealand falling to 175,500 in March 2020 compared with 202,700 in March 2019 (Stats NZ, 2020). Tourism Minister Kelvin Davis has said that international tourism is expected to be limited for some time (Radio New Zealand, 2020b), with some industry experts warning that international travel will not run at full capacity until 2023 (Stuff, 2020). The tourism industry has been one of the hardest hit sectors of the New Zealand economy; "This has been an immensely challenging situation for our tourism industry", said Kelvin Davis (Radio New Zealand, 2020). As West Coast tourism generates a substantial part of its revenue from international visitors, it has been acutely affected by the COVID-19 situation. It is difficult to determine whether planning and policy measures could have protected the West Coast tourism economy from such a significant shock. Bianchi (2018) suggests that tourism destinations which are susceptible to global capital flows cannot be safeguarded by management and planning operations alone, and instead require a profound paradigm shift in the structure of the global tourism economy (Bianchi, 2018).

Following government directives, DOC closed all their public facilities, including tracks and huts, when New Zealand went into lockdown (Department of Conservation, 2020b). Now that New

Zealand is emerging from lockdown restrictions, DOC have reopened these facilities and are assisting with the country's economic recovery. The government have budgeted for $501.8 million dollars towards nature-based jobs as part of the COVID-19 Economic Reset and Recovery package, and there is growing momentum for the environment to be at the forefront of New Zealand's COVID-19 recovery (Department of Conservation, 2020a). There are also discussions already underway about the future of tourism in New Zealand, with Tourism New Zealand chief executive Stephen England-Hall saying that it is an opportunity to listen to communities and design the future of tourism for New Zealand (Radio New Zealand, 2020). This seems to echo Simmons' (1994) call for more community-based tourism planning and greater integration of public participation in tourism development. Tourism businesses are already adapting to the new situation, and turning their focus towards the domestic tourism market. For instance, various tourism operators on the West Coast have banded together to provide package deals for domestic tourists. One such deal includes half-price entry to the West Coast Treetop Walk near Hokitika, 20 per cent off skydiving at Franz and Fox Glacier, and a two-night stay at the Fox Glacier Top 10 Holiday Park (Carroll, 2020).

In terms of planning around visitor access to the glaciers, perhaps the reduced number of visitors will give decision-makers the necessary time to re-imagine their long-term vision for tourism on the West Coast. If this vision does include tourism dispersal, now may be the time to develop a framework or model to guide this dispersal, and work alongside local communities to implement this vision. The lull in international visitor numbers may also provide decision-makers the breathing room to respond to the closure of the Fox glacier road, and to implement alternative access options that benefit both the local community and the national park.

6.5 Conclusion

While there are many factors affecting visitor access to the Franz Josef and Fox glaciers, it is clear the planning sector is already attempting to address these issues. Both amendments to the WNPMP, and DOC's new long-term visitor strategy are addressing changes to glacier access, albeit in different ways. Each of these strategies show the strengths and weaknesses of statutory and non-statutory planning mechanisms in responding to ongoing biophysical changes in dynamic environments. However, the adaptive capacities of these planning mechanisms could be strengthened by increasing their collaboration, as well as working alongside communities so that planning outcomes better reflect the desires of local communities and a longer planning horizon. Whereas the planning sector had little time to anticipate and react to COVID-19, climate change and associated glacier retreat is a 'slow-burn' crisis, meaning that there is time to develop and implement effective planning solutions, and this time should not be taken for granted.

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Appendix A Research information sheet

Lincoln University
ERST660: Research Dissertation
Research Information Sheet

You are invited to participate as a subject in a project entitled:
Planning for tourism access to West Coast glacier county.

The aim of this project is:
To explore the risks and opportunities of maintaining visitor access to the Franz Josef and Fox glaciers of Westland *Tai Poutini* National Park, within the planning context.

Your participation in this project will involve:
A face to face interview of approximately 30 minutes to 1 hour long

As a follow-up to this activity, you may be asked to:
Provide further details via email or phone

In the performance of the tasks and application of the procedures, there are risks of:
There are no foreseen risks of you participating in this research.
The results of the project may be published, but you may be assured of your anonymity in this investigation: the identity of any participant will not be made public, or made known to any person other than the researcher, his or her supervisors, and the Human Ethics Committee, without the participant's knowledge. To ensure anonymity and confidentiality the following steps will be taken:

- Pseudonyms will be used in place of actual names
- Where appropriate to do so, and with the participants consent, job titles will be used in place of actual names

The project is being carried out by:

Emily Somerfield
Emily.Somerfield@lincolnuni.ac.nz
0204 110 1078
She will be pleased to discuss any concerns you have about participation in the project.

Name of supervisors:
Emma J. Stewart PhD (03 423 0500) - emma.stewart@lincoln.ac.nz
Stephen Espiner - Stephen.Espiner@lincoln.ac.nz

Appendix B

Participant consent form

Planning for visitor access to West Coast Glacier Country

I have read and understood the description of the above-named project. On this basis I agree to participate in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I understand also that I may withdraw from the project, including withdrawal of any information I have provided, up to March 1st 2020.

Please indicate whether you consent to the interview being recorded by ticking the appropriate box below:

- ☐ I consent to having an audio recording made of my interview.
- ☐ I do not consent to having an audio recording made of my interview, but agree to notes being made.

Name: _____

Signed: _____ Date: _____

Appendix C

Interview questions

(Note: interview questions were modified for each participant based on their background and area of expertise)

Your Role

- What is your role/how long have you been doing it?

Tourism

- How important is tourism to the Westcoast?
- Key challenges and opportunities facing WC tourism at the moment
- Why do you think visitors come to WNP? Have these motives changed over time?
- How do you think WC tourism could be improved?
- Talk about the relationship between tourism and conservation (in National Park setting)

Natural Hazards

- How is Tourism on the Westcoast impacted by natural hazards?
- Most significant natural hazards in the Westcoast (particularly Franz Josef/Fox areas)
    - Key challenges/impacts of these hazards for tourism
    - How do you manage tourists during an emergency?/key challenges for tourist management in emergency/ how this could be improved

Glaciers

- How do you ensure visitor/tourist safety in glacier areas?
- Have you considered what might happen in the future as a result of climate change and any tourism implications this may have?
- How significant have glacier-related changes been for the Westcoast tourism industry? (e.g. Fox glacier access road being closed, glacier retreat)
    - Have these changes affected visitor numbers/demand/satisfaction?
    - How have visitors adapted to these changes? How successful have these actions been?
    - How have organisations/businesses adapted to these changes? How successful have these actions been?

Access

- State highway 6
    - How are the risks managed?
    - How could the situation be improved?
- Fox glacier access road
    - Landslide risk and decision to close road
    - Impact on tourism/local community/compensation/is this deterring tourists?
- Direct access onto the glaciers
    - Aircraft access to the glaciers – challenges and concerns?
- Other options/future options to access the glaciers
- How do you think diminished visitor access would affect the West Coast?
- Any other issues/future issues you think may affect visitor access to the glaciers/& wider area?

Other options

- What options are available for tourism should the glaciers become completely inaccessible?